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The
GEOGRAPHICAL JOURNAL

Vol LXXIII No 3 R.G.S. *March 1929*

THE SOUTH-EASTERN BORDERLANDS OF RUB' AL KHALI:

A paper read at the Evening Meeting of the Society on 3 December 1928
by

BERTRAM THOMAS

IF across the map of Arabia a diagonal line be drawn from Bahrein to Aden, the triangle to the south-east, with its apex at Ras al Had, encloses the great desert, the Rub' al Khali, or "empty quarter." Bounded by habitable Nejd on the north-west, and by coastal strips of 'Oman, Hadhramaut, and Yemen on the north, south, and west respectively, here is a vast unknown region of 300,000 square miles of probably uninhabited scorching sand and arid steppe that is a name of terror throughout Arabia. Two obstacles bar the way to scientific investigation: (1) its sterility is of a peculiarly prohibitive kind; (2) its every avenue of entry and exit is closed by a people who are fiercely jealous of the secrets of their poor marches and water-holes, who are predisposed to intolerance of foreign penetration in whatever guise, and with whom—and every man of them goes armed to the teeth—the shedding of blood has no terrors.

'Oman, cut off from west and north by this great wedge of desert, receives scant attention from the classical geographers, and if we know little of the rest of the continent, here we know even less. The map of South-Eastern Arabia was, of necessity, blank, and my journey through these southern borderlands of the great desert was undertaken partly to fill empty map spaces, and partly to satisfy my curiosity concerning its strange peoples and languages, about whom and which I had heard odd accounts. The only European exploration on record consisted of Wellsted's visit to the eastern province of Ja'alan in 1835, and the Bents' visit to the mountains of Dhufar in the central South in the early 'nineties. Between lay a stretch of 500 miles untrodden by a European.

On December 28 last year I arrived at Suwaih, a fishing village near Ras al Had, in the Muscat State patrol ship, cherishing the faint hope of making my way overland from there to Dhufar. I had six weeks' local leave due to me, but I travelled under no Government auspices. Assuming Arab dress, wearing a beard, foregoing tobacco and alcohol, and sharing the life of my Badawi, these were, I knew, the most hopeful paths.

At the outset my chance of success centred in the Amir of Bani Bu 'Ali, the most considerable shaikh in these parts, who as yet knew nothing of my project. No European had, I think, been permitted to visit his town of Balad Bani Bu'Ali for ninety-three years, so that when my messenger to him returned with an equivocal answer I could only draw the gloomiest conclusions about my prospects. The next day, however, a camel escort of forty men arrived under the Amir's brother, and, losing no time, I joined their party and headed for the interior.

We moved off from Suwaih a little to the south of the setting sun with small sand hillocks on either side, crossing here and there a wide shell-flecked khor bed. The lack of any vegetation except sparse camel thorn appeared no hindrance to a cloud of large red locusts which, during the space of ten minutes, formed an escort. After an hour and a half we halted for evening prayers—the party were all Wahhabis—mounting immediately afterwards to turn north, and arrive after nightfall at a halting-place. Ghina, as this was called, is a small acacia (ghaf) grove between low sand-dunes, and marks the point where Wadi Hasad, coming down from the Ja'alan Mountains, turns north-east to the coast. The night was cold, but I was apprehensive of using my aneroid or thermometer, as I had been of using my prismatic compass coming along the road, lest suspicion be excited in my companions, and my plans prejudiced before they were unfolded.

On the far side a tower guards the entrance to Ghina, and past this we entered a wide shingly plain, crossed in its gradual ascent by numerous wadi troughs, presumably the delta channels of the great Wadi Batha, the artery of intra-montane 'Oman from Jabal Akhdhar to the Indian Ocean.

Passing the three Janabi villages of Juwaibi, 'Ayun and Al Qatara, each set in a patch of date palms, we moved up on to another sandy patch with low sand-hills encroaching on both sides of the road, and here were met by a troop of horsemen under the Amir 'Ali. After the usual exchange of greetings we pushed on, sand and gravel alternating till we reached the high ground, thick with another variety of acacia (samr), looking down upon the rich date groves lining the Wadi Batha about Balad Bani Bu 'Ali. The scene is rather a striking one. A dense grove of tall date palms lining both banks of the wadi stretches away to the north-west, and marks the wadi bed already mentioned, from which "falajes" sustain the life of all the chief towns of Sharqiya and 'Oman Proper. Before the date grove, in an open space, stands the Amir's fort, and round about the reed huts and small bazaar of the village. In the clearings are many lanky towers, suggesting in shape those of the Trucial coast rather than their squat neighbours of the Sultanate.

Upon our arrival at the fort there followed the usual ceremonious welcome of the courteous Arab, sword dance, *jeu de joie*, horse and camel-racing, the ululations of veiled women, and the feast. Nowhere else have I seen horsemen standing on their galloping horses, and without the aid of stirrups maintaining a precarious equilibrium by resting a hand on a normally seated fellow-rider, and by gripping the saddle with their toes. An interesting survival was the chanting of heroic verse of Antar by a leader, every line being punctuated by a mighty shout in unison of "Allahu Akbar" (God is great) by the rest of the troop. I was given a horse to see the battlefields of 1820 and 1821, and the

village, but Wellsted's description of these makes another superfluous. Before continuing with the narrative of my journey, however, it may be of interest to say a word about the province of Ja'alan and its people. Roughly speaking, it is the territory eastward of the 59th line of longitude, the heel of Arabia closest to India. In it are two tribes and part of a third of great importance, the Bani Bu 'Ali, Bani Bu Hasan, and elements of the Janaba. The copper currency which circulates exclusively in the Ja'alan, the origin of which is locally unknown, is curiously enough neither Muscati nor Indian; but Mr. Allen of the British Museum, to whom I submitted specimens, considers it to be eighteenth-century Persian of a type struck by local governors. The Ja'alan population, numbering 12,000, is divided between the Hinawi (Bani Bu Hasan) and Ghafari factions (the rest), and in consequence the province is in a perpetual state of feud. Wellsted, in 1835, had seen Bani Bu 'Ali tribesmen going forth on the war-path accompanied by their women carrying powder and water-skins, and I witnessed the same thing on January 1 of this year. The Bani Bu 'Ali are the Bliulaie of Ptolemy. They and most of the Badawi elements of the Janaba of Ja'alan have been Wahhabis, the puritanical persuasion of Nejd, since 1809, and the title "Amir" was conferred upon the shaikh by a former Ibn Sa'ud. The Janaba are a widespread confederation stretching a third of the way across South Arabia from Ras al Had to the longitude of Kuria Muria Islands, except for a 50-mile wedge of hostile Hinawi territory of Yal Wahiba, eastward of Wadi Halfain. This divides the Badawi into two, the eastern section or Ja'alan Janaba chiefly Wahhabi and followers of the Amir of Bani Bu 'Ali, and the Western Janaba who are Shaf'i and followers of the Shaikh of Masira, and these two Shaikhs are close allies.

On the morning after my arrival, I broached my project to the Amir, and his brow became troubled. There was, he said, a crop of obstacles: (1) Manahil and 'Afar raiders made the road dangerous, and he would be hauled over the coals if we didn't get through or back; (2) he had no one who knew the road, as the sea route is safe and popular, except during the summer months when the South-West Monsoon cuts sea communication for small craft throughout the length of the south coast; (3) the hostile Yal Wahiba territory made it necessary to have a Hinawi rafiq, and in the present war atmosphere none was to be had; (4) Badawi would never risk camels for such a foolhardy enterprise, and if I wanted camels I must buy them and then be prepared to lose them on the road. I was despondent. A week of patient argument followed. At last I succeeded in hiring a caravan of twelve men and fifteen camels as far as Khaluf, a third of my journey. This assistance I owed to the Amir and without it the journey could not have been embarked upon, but it was conditioned by my giving him a letter absolving him from responsibility against disaster befalling, and I moved under the cloud of the knowledge that the shaikhs on the road before me might be less sympathetic and turn me back.

My escort consisted of Wahhabis except for my Yal Wahiba "rafiq," an Ibadhi, and my secretary, a Shi'a. The Wahhabism of Ja'alan is very strict. Ibadhism, the neighbouring sect of 'Oman, has in its purest practice certain resemblances to Wahhabism: (1) it is not less puritanical; (2) it is almost equally antagonistic to other sects; (3) it proscribes tobacco. But in Ja'alan the pro-

scription of tobacco is absolute, and I gathered from the Amir that punishment for an offender would be a fortnight on short rations with an occasional beating, or until there were signs of penitence.

Personal stores for my journey were of necessity kept down by limited transport, for my three spare camels were already burdened with instruments consisting of a sextant, artificial horizon, two chronometer watches, prismatic compass, barometer, thermometer, and camera, beside a box of drugs, date rations for the animals, and dates and rice for men. My diet for the next seven weeks consisted chiefly of dates, rice, and camels' milk, with occasional goat or gazelle meat.

From Balad Bani Bu 'Ali our immediate course lay east of south towards the twin peaks of J. Siyah, through a pleasant scattered "samr" jungle until, crossing Wadi Batha a few miles below our starting-point, we turned south into a scrub plain, Sih ar Rumth. We continued until dark, approaching high ground to the south, low limestone ridges on our left hand and to our right low sandhills thick with "ghaf." This brought us to a salt depression beyond which we halted at a water-hole called Kabit on the edge of a thick acacia grove. This grove, which runs along a raised sandy ridge for 23 miles having a north-and-south axis, is known as Wadi 'Ubaidha, the term "wadi" being here employed not in the conventional topographical sense. To the west and north-west of it my escort avowed that sand stretched continuously to the Hajar Mountains and Wadi 'Andam—an eastern island of Rub' al Khali, it would seem—though this information would appear to conflict with the terrain to the south-west of Balad Bani Bu 'Ali which Wellsted describes. My desire to take a more northerly route through this area was met with the reply that there was absolutely no water there.

I spent the next two days moving along the eastern edge of Wadi 'Ubaidha, bivouacking at Haniya and Sufaij, first through "umm as sabkha"—a large salt-crusted depression, now and then relieved by patches of sandy soil rich in camel thorn to which type of country it finally gives way. Two and three-quarter hours south of Kabit we passed two small hillocks presumably of basalt formation suggestive of cinder heaps with small jagged chunks strewn in the neighbouring plain and another hill of the same kind when passing J. Faiya. Throughout Wadi 'Ubaidha sweet water is found, and Janaba Badawi here breed good camels. Their living quarters are extremely primitive—an acacia thatch, horseshoe shaped and scarcely deserving the name of hut. It is placed usually under a spreading acacia, a few water-skins hang from a branch, a basket of dates, suggestive of a rook's nest, is suspended in the topmost branches out of reach of the camel. A woman, some young children, and a herd of young goats fill up the picture. The woman emerges veiled, not with a proper "burqu'," but with only her garment worn over her head as a makeshift, and in the absence of her man, to offer us water. Nowhere in South-East Arabia did I see a camels'-hair tent.

From time to time we passed a large hollow wood stack far from habitation. This is the Badu's storehouse, called a "damus." Here his winter supply of dates and fish are protected from camels and wild beasts. This he abandons for days at a time, knowing that his neighbours will not touch it: the "damus" is sacrosanct. In sandy country to the west the "damus" took the form of a

Amir's fort, Balad Bani Bu 'Ali

Arab escort—Janabis and Yal Wahiba

Balad Bani Bu 'Ali

Sand country of Yal Wahiba

Wadi ʿUbaidha

The Well of Haij, Wadi Halfain

hole in the sand covered with a turtle's shell. Turtles are plentiful throughout the 'Oman coasts.

Early morning starts were prevented by the routine of cleaning instruments, writing up records, and holding a sick parade, for I had equipped myself with a large supply of quinine and the simpler drugs, and the sick of every settlement met on the road came with their tales of woe.

Leaving the "ghaf" jungle where it ends at Sufaij, we struck towards the coast through scrub country. On our right-hand skyline the low pink sand dunes closed in to our front. Our descent was more real than apparent, for at Abu 'Akaisha, our next halt, water was found at 6 feet in contrast to the 42 feet at Sufaij that morning. We halted for lunch on an eminence where was a red chert outcrop. Khuwaiyim, as this region is called, is the frontier between the Ja'alan Janaba and the Yal Wahiba tribe. Soon after leaving Khuwaiyim we got a glimpse of the sea, and for the next two days were pinned to the coast by the hummocky sand country of Yal Wahiba, which here debouches on to the shores of the Indian Ocean. The population live by fishing, and the strand of Dhunaiyin, Qushaiyit Quhaid and Ghalat—incidentally, names here apply to an area rather than exclusively to a settlement or water-hole—along which we passed before reaching Bil 'Akairish, was strewn with fish heads and tails, that of the hammer-headed shark being common amongst the former. Although the sea swarms with these monsters they appear to have no terrors for the inhabitants. I saw men both here and later on in Sauqira Bay, swimming on an inflated skin—reminiscent of a certain Assyrian bas-relief in the British Museum—and laying their nets with impunity. Sardines and a small herring are caught in great quantities and dried for camel fodder. On the seashore were large patches of them being kept watch over from seabirds by young girls armed with catapults. Larger fish are salted and taken by camel across the desert to the Sharqiya towns of Badiya and Mudhaibi, a journey of four days through high sand-dune country destitute of water. There are four routes, three from Ghalat, namely Darb Fuwahi, Muqta'al Habl, Shauqub, and one from Qudaima named Darb Shaqqa As Sih. Fishing here is chiefly confined to the winter months: in the summer the entire population of South Arabia as far as Jazir gravitate to the date gardens of 'Oman to sojourn "qaiyidh" during the time of the ripening fruit. The Yal Wahiba go to the Sharqiya and the Janaba to Ja'alan, moving with their families, they take the longer route around the fringe of the sand country rather than the direct crossing.

We left our lofty horseshoe sand-dune camp at Bil 'Akairish and crossed—having to dismount for the purpose—some other high sand-dunes behind Ras Ruwais (R. Shaiballa of the chart), passing on the raised foreshore some curious-shaped outcrop of shale, dipping seaward, and representing from a distance an army of frogs in profile. Moving down to the sea-beach, we did not leave it until reaching Ras Nuqda (Ras Shanna of chart). Here it was necessary to avoid the low salt flats of Bar al Hikman, and we turned west through scrub country, the right-hand sky-line consisting of low and even sand. The sand-dunes beyond, I was informed, were of the small variety known as "'uqr," as opposed to the larger "badair" which we had met with. Later in the day, bearing more to the north on an angle of 310°, we climbed gradually

into rolling uplands with occasional acacia, a welcome sight, for it meant firewood, of which we had seen none for some days. Water-holes here are scarce, and water is brackish. Footprints of every conceivable domestic animal and many wild ones led to our next water-hole Umm al Qutna, though I saw nothing wild alive bigger than the abu la'ab, the desert lizard of the commonest kind. My Yal Wahiba guide told me that in the past wolf, panther, and hyena were common hereabouts, but their numbers had diminished with the consistently decreasing rainfall of recent years, which has been desiccating South-East Arabia. His assertion that rain, when it came—and it had not come for eight years—came with the south-west monsoon of summer, rather than the winter rain of the Persian Gulf, seemed all wrong. Oddly enough, it rained that same night, January 10, with a light north-easterly wind.

The following morning we left Umm al Qutna, and following a course a little to the south of west through rolling sandy country for an hour, entered a large straggling acacia jungle, called Da'asal. Here are a few Yal Wahiba settlements, and camels were met laden with water from Umm al Qutna, apparently for the flocks. Three hours sufficed to bring us by a rather devious course to the far side, and thence we climbed to a shelf with igneous outcrops, soon afterwards crossing two wadi beds lined with acacias at no great distance from each other, the dry lower courses of Wadi Halfain which here spread out delta fashion and debouch on to the marshy flats of Ghubbat Hashish. We camped in the Wadi Halfain at Haij. The sky becoming overcast prevented my taking star sights that evening, and a drizzling rain developed into a storm. My small tent came crashing about my ears in the small hours amidst thunder and lightning; my Badawi were drenched to the skin, but the wadi did not flow. In contrast to the poor water-holes in the sand I had so far met with, the well of Haij was imposing. Six feet in diameter, it was well built of large stones, polished with age, with projecting stones at convenient intervals to admit of descent, and grooves half-inch deep edging the lip caused by long contact of bucket-ropes, suggested a high antiquity. The Hikmanis of Mahot and Bar al Hikman obtain their water from Haij, and two Hikmani girls were watering their camels when we arrived at the well. Water was plentiful at 20 feet.

The Wadi Halfain system is the most important Badawi corridor between Northern 'Oman and the Indian Ocean. It would also appear to divide the sands of Rub' al Khali, isolating the triangular island of sand which runs up into Ja'alan; and along the southern borders of this my journey had so far lain. Wellsted and Miles have in their maps tentatively suggested the course of the Wadi Halfain system in different ways. The course I have shown on my map differs from both. While it would be preposterous to discredit earlier travellers by the assumption that it is "all fish that comes to one's own net," it is necessary to set down the information that one elicited from Yal Wahiba tribesmen who live in these marches. The system in its upper reaches is said to consist of two main wadis, Halfain and 'Andam, which pursuing different courses do not unite. Both rise fairly close at Yardi near Khadhra, and in their upper courses have perennial water and support settlements of Bani Riyam and 'Awamir; both run south in tortuous fashion, dry in their middle courses, Halfain to reach the sea opposite Mahot, and 'Andam to lose itself in the sands

to the south of Nafi. Besides the corridor which this system provides for the Janabi to Adam, and for the Yal Wahibi to the Sharqiya and Batina, its middle courses are the grazing-grounds of both, and it was here incidentally that I had to turn for my next relay of camels to carry me on through the second stage of the journey. Leaving Haij we moved south-westwards over rugged broken country, crossing two more delta outlets of Wadi Halfain, and three hours later were overlooking from a height of about 100 feet the great sweep of Ghubbat Hashish, with the islands of Riq Mahot and Ab presenting odd shapes above the mirage. The rains had made the beach a veritable death-trap for camels, prone to fatal splits, and it required much cajoling before I could induce the Badawi owners to risk the crossing, they being minded to halt. The rest of the day, which was raw and cold, we spent timorously crossing the bog-like strand, the camels, lightened of their riders, still slipping about in all directions; and finally we arrived after dark at Khaluf, a village under R. Khaluf (R. Abana of the chart), and the residence at the time of the Shaikh of Masira. To him I was now to turn. The arguments of Balad Bani Bu 'Ali were advanced against my plans, and I again spent six days of suspense not knowing whether my importunities would succeed or not. Meanwhile I sent back the Ja'alan camels and despatched messengers to Wadi Halfain to raise others. The Shaikh became more and more sympathetic, but the villagers were suspicious, and my party were subjected to unpleasant cross-examination while I was a virtual prisoner in my tent. I had sent a messenger one day to the Shaikh suggesting a trip to Mahot Island in his "badan"; to receive the answer that the people were already excited by the presence of a foreigner, that he was sorry a boat was not available for Mahot, but I could have one if I desired to take me to Dhufar—in short, a hint to abandon the journey. Having the day before tried to take one or two photographs of the natives and excited their displeasure thereby, I decided the only hope of success was to sit tight and exercise disinterested patience.

Khaluf is an unprepossessing collection of mud huts on a bare repellent plain with a sea-front of perhaps half a mile, off which a few fishing badans may be at anchor. The plain runs back a mile in depth, surrounded by low flat shale hills. Fishermen sit everywhere making nets and smoking a short clay pipe, for the Western Janaba, being Shafis, may use tobacco. The fish they catch are chiefly shark and "qanad." The fins and tails of the former are sent to China, where they command a high price and make an epicurean soup: the flesh of the latter is salted and exported to the interior, to Zanzibar, and to Mukalla.

My camels arrived on the 16th, and also Luwaiti, a Harsusi "rafiq." The following day we left Khaluf by the back of the town, the shaikh's brother giving me his camel to ride, and crossing a ridge behind Ras Khaluf (R. Abana of charts), descended to the seashore on the far side. Under a strong sun we continued thus for two hours, low white sand-hills coming down close to the beach. Our progress was slow. The new camels seemed dead tired, but were not so, being in reality an inferior breed to those of Ja'alan. I was to discover that there is a consistent deterioration of riding qualities as I progressed westwards, until the camels of the central south were quite useless for long treks, being bred chiefly for their milk.

Climbing behind another headland brought us to the beach again, now much wider. Shell-strewn, and relieved by an occasional large blue convolvulus here and there, it ran below hills which ended in rusty-coloured bluffs. Here was much sea-bird life; flamingoes stalked about, the calm sea was chequered with black patches of gulls, while in the offing three whales were playing. Leaving this Bay of Bintaut, we struck inland towards a gap in the hills, the Wadi Shitta, across a large flat salt plain called Rudda. Under the low dark hills to our right, called Jabal Dhinqil, lay a patch of "ghaf" apparently about a mile in length and called Wadi Jinah. We halted for the night in a plain called Ghalil near a patch of large glazed boulders on a small pebble floor, and just short of a sandy ridge screening the entrance to Wadi Sarab. Beyond the ridge lay Hudhaiyir, flat scrub country where next morning we came upon grazing flocks, amongst them white sheep, the first I had seen in South-East Arabia. An hour and a half served to bring us to the entrance of Wadi Sarab, a gaping valley 1000 yards in width, where it debouched on to the plain. Its thick acacia jungle looked refreshingly green after the arid sands of the previous fortnight. As we continued up it on a southerly bearing, the hills, which were of very weathered appearance and about 100 feet high, closed in. And here I experienced my first hold-up of the journey. Luwaiti, my rafiq, and I, tired of the monotonous walking pace, and discovering that we were both thirsty, were trotting a half-mile ahead of our caravan in quest of milk. Now trotting is the pace of the raider, and is calculated to induce suspicion and alarm in a strange country. Suddenly through the jungle, 200 yards to our front, came a burst of rifle-fire, the bullets pinging uncomfortably close above our heads. Luwaiti excitedly signalled me to stop, then galloped boldly in the direction of the firers, waving his headdress above his head and shouting an unknown jargon. This is here the manner of the "rafiq.' Five minutes' silence elapsed, followed by the return of Luwaiti with six of his fellow tribesmen, sullen and as much frightened as we. Suffering nothing worse than a few recriminating remarks from my own Badawi, who had now caught up, for having been responsible for what might have been an ugly situation, we moved on; but I was enjoined never to get out of a walk, and all insisted on the necessity of the caravan keeping together. We halted for lunch at the head of the gorge, where, as a result of recent rains, water was plentiful in surface pools, edged with oleander, and in a small cavern 3 fathoms deep. Near by on an eminence was a collection of stones, as of a monster grave, the first example I met of what afterwards was to prove an archæological discovery of much interest. But so soon after this excitement I judged the moment inopportune to make an extended halt for investigation, and we got on the move again. Leaving the Wadi on the left-hand side, the road climbs steeply through barren hills. At the top, where my aneroid registered 400 feet, we turned north and descended on to a broad expanse of tall coarse grass plain, called Manadhif, where I decided to halt. As we halted, a hare scampered away, the first I had seen. Large black-and-white flocks indicated a settlement, and soon a crowd of friendly Harasis brought bowls of delicious millk along.

I was struck by the extraordinarily placid and intelligent faces of the youths, almost Southern European in appearance, by the lock of hair along the top of the head—suggestive of a Hindu caste or the horus lock—worn by young

male children, and by the refinement in the voices of the women. Here for the first time I heard a language that was not Arabic and could not be understood by my Badawi, but was of course understood by Luwaiti, himself a Harsusi. Fortunately the Harasis understood Arabic as well, speaking it with a strange sing-song but pleasing inflexion of voice. The evening I spent in acquiring a list of Harsusi words. My attempts at measuring their heads were less successful; they would have none of what savoured of the magical. They had strange names, at least names other than the familiar Arab ones. My guide's daughter gloried in that of 'Aqrab, *i.e.* scorpion. She came to welcome her father, which she did by raising her veil (the older ladies of the tribe were unveiled) and rubbing noses with him. My would-be murderers of the morning, no doubt hungry and scenting a meal, came with Ibn Akis, their traditional but now nominal paramount shaikh, and joined our festive board—here a mat. These Harasis, a noble and once important tribe which has shrunk to a few hundred men, have no exclusive habitat, but roam the Jaddat al Harasis, which in theory is Janaba territory in the steppe hinterlands, to the west of the point we had arrived at, a stretch eight days' march in length.

The following morning we moved up into slight hills on the far side of the plain to the divide between Manadhif and Dhu Nakhr. The descent to the latter was through a large area of slate outcrops of dark red or purple colour, and the low hills on both sides were speckled white with a salt efflorescence. As we descended, a large isolated hill of striking fantastic shape, more or less conical, loomed up out of the wadi bed. Its name, Jabal Hamr, mystified me, as it appeared quite black, and not red as its name implied, when approaching it from the north-east in the morning light. The mystery was elucidated when, on passing across its front, its base was seen to be surrounded by red slaty beds, and its summit is red above a darker-coloured formation below, bearing the white speckled appearance already noticed. It appeared to tower between 300 and 400 feet above us, which, with my aneroid reading at the base, would determine its height at about 750 feet. Our course led westerly up the Wadi Hamr, a tributary of Dhu Nakhr; the low containing hills were of interest in their pyramidal shapes with sliced flat tops. This day and the next we saw no human being as we passed through the undulating plain with occasional acacia, the remote upper courses of Wadis Adhli and Anqau. Leaving this stony wilderness on the morning of January 20, we turned east of south and proceeded to descend coastwards through the narrow gorge of Anqau. Steep and tortuous with enormous fallen boulders blocking the path, were it slightly worse no camel could tackle it. As it was, our pace was reduced to about 1½ miles per hour. The effect of the great heat radiated from the mountains was unpleasant, and having no luggage I was emboldened to get ahead of my companions, and so arrived below to await the descent of the caravan. When it came I was promptly taken to task again for my breaking the rule about keeping together. They avowed that two Janabi tribesmen had spotted me from afar, suspected me for a raider through having an unusual saddle—mine was a Bikaner pattern—and had stalked me.

Here at the bottom lay the plain opposite the island of Hamar Nafur, where oil seepages had once been reported, and where I recalled that two years before a geological party had landed and was greeted by a hail of stones. We

lunched before the entrance of Wadi Dhamur. In the distance, on a bearing of 125°, loomed the hog-backed Jabal Duqqam. The top of Wadi Dhamur led on to a large expanse of plain with a low flat table mountain to the front. By way of Wadi Mudhrib we moved on to the plain of Adh Dhahir, and for three days crossed its bare wastes falling imperceptibly in 50 miles from 470 feet to sea-level at Juwara on Sauqira Bay. The drainage is from north-west to south-east, and three slight wadi depressions trending coastwards, Ruwaidha, Timrit, Burthana, merge into the Wadi Marzun or Wadi Dhahir, which empties into the sea to the west of Ras Madraka at Gharib. The feature of the scant vegetation of this stony plain is "samr" as distinct from the "ghaf," which latter had been the predominant type in the eastern sandy stages of the journey.

Hamuda dismounted from time to time to catch and bring to me on his palm some quaint lizards. One, slightly larger than "abu la'ab," is a rather beautiful creature with a blue-capped head. Another, still larger and approximating in size to the "dabba," is "abu khadhra," of striking green colour with a dark red spine marking and a fat oval tail with lattice markings; on the move it waggles this from side to side as if propelled by it.

This stage of the journey had been parallel with, and about 25 miles inland from, the coast of the Gulf of Masira, on whose headlands I was able to get cross bearings. Its monotony was relieved only by one or two scares of raiding parties. Fear in the desert seems mutual, and the feelings of a party of raiders must be very like those of the old sea pirates who never knew when their quarry was going to turn out to be stronger than themselves. We certainly caused fright as well as experienced it. On more than one occasion a Badu or two would haul into sight on the skyline, spot us, turn and gallop off in the direction whence they had come. This I was told meant that they would round up fellow-tribesmen, who, mistaking us for raiders, would lay up for us ahead and ambush us without risking explanations. This never happened. We must have made too brave a picture.

To the west and north the steppe country of Jaddat Harasis continues unbroken to merge in the waterless sands of Rub' al Khali. In the latter stages before reaching Juwara, the hot gravelly broken desert boasted not a tree for shade. As we approached Wadi Dharif, where countless camels of the Janaba were grazing, we were held up by a fusilade which continued intermittently for some minutes. A Janabi rafiq went ahead and cleared the way for us to come on, and we watered over a brackish hole near to a lagoon where some hundred men and women of the Janaba assembled to see us. Nearly fifty fishing "badans" of the Ja'alan were lying at anchor off the shore. We moved on and halted for the night at a "ghubra," thick jungly scrub growing out of diminutive sand-hills. Jazir is the name given to the narrow coastal plain stretching from here to Ras Sauqira below a slight igneous formation. Desolate repellent country it is, its only merit at the time being a comparative absence of dews, in contrast to the heavy nightly dews of Adh Dhahir behind us and Jaddat Arkat before us. Evidences of what was pointed out to me as a wolf and cub tracks indicated visits to the sea-beach in search of fish diet, and the beach itself was in parts pitted by the burrowings of vast numbers of tiny crabs which loitered just below the brink, peering periscopically for our passing. Here the water-

hole, generally brackish, does not, as had been the case throughout the journey, bear the name of the wadi in which it is found. Khor Ruri in Wadi Qadan tasted, what little there was of it, strongly of sulphur. A high wind, full of sand, which got into everything, made photography impossible, and the cleaning of instruments irksome.

From Lisk and Wadi 'Ainain I returned the camels to the Shaikh of Masira at Khaluf, and dismissed the Harsusi rafiq as I had contracted to do, and I now had to cast round to form another caravan to see me on to Dhufar. Some Harasis Badawi were grazing in the neighbourhood, and I was able to make an agreement with them. I had sent Hamuda, a recently acquired Janabi rafiq, to Lakbi to buy some butter, dates, coffee, and fish. Here in South Arabia the Badu would never in the ordinary course pay a fisherman. If fish have been caught he expects a fish or two without payment. Meanwhile the rest of my party were feasting on locusts.

In our last day's march through the well-wooded country towards Wadi 'Ainain, we had passed through a barrage, 6 miles deep, of red locusts, similar to those I saw at Suwaih, and this provided us with a change of diet, if not a square meal.

At length, on January 30, completion of our preparations allowed us to move on. Up to this point I had enjoyed the good offices of the two most influential local chieftains of the south-east, the Amir of Bani Bu 'Ali and his ally the Shaikh of Masira and Western Janaba, and water, if it was not plentiful, was generally available at intervals of a day's march. Before me, however, in the intramontane uplands of the central-south, there was no single local paramount chief to whom I could look to afford any measure of protection, and water was practically non-existent. A gap between symmetrical dark-coloured hills, sloping at an angle of 45°, marks the entrance to Wadi 'Ainain. We ascended its tortuous course in a general south-westerly direction, its shingle bed being almost treeless except along the bottom slopes of the containing hills. These, nearly 150 feet high at the entrance, have shrunk to half that height 12 miles up, where higher white flat-topped ridges loom above and beyond them on both sides, Raqab ash Sharqi and Raqab al Gharbi respectively. We continued throughout the day in this wadi bed, the only signs of habitation being a tribesman of the Bautahara—a despised non-Arab tribe of ignoble origin but high antiquity—who fled on sight of us, and a Janabi shepherdess with flocks making eastwards.

In sight of the Multkimauti Pass we halted for the night. On the morrow it led us 150 feet above to the Jaddat Arkat, a plain of 50 miles extent, rising westwards from 540 feet to 1000 feet, broken to the north by low ridges, and stretching away to the south to the hills bordering Kuria Muria Bay. Two wadis, Barzana and Zuwa'ab, crossed our path in a south-easterly direction, but neither, I gathered, reached the sea. Absence of water (though there were heavy dews) and bitter cold at night—the temperature falling to 44°—seemed to have no effect on the flies, which by day, whenever the wind dropped, were a great pest. At Barzana I despatched one of my escorting Harasis to Shuwamiya on the coast to fill our water-skins, and fetch a Bautahari tribesman for my edification. There was not sufficient water left for my thermometer. For drinking I squeezed sufficient milk out of my camel, but the rest of the

party uncomplainingly went dry. They satisfied their hunger with locusts, a store of which they had brought along in their saddle-bags from Wadi 'Aınaın, and some meat-bones. Hamuda, my new Ghafari rafiq I had acquired at Jazir for this last phase of my journey, was sucking at the marrow of a thigh-bone of a sheep, and volunteered the remark that "mukha," the equivalent of the camel anatomy, "is delectable food, better even than the camel's flesh." This I was well content to believe, having only partaken of the flesh. Half an hour south of our bivouac I was taken to see an old tank-like depression, 130 paces long, 80 wide, and with perpendicular sides of 8 to 10 feet, exposing a surface of soft limestone. According to local tradition, this depression of Lahit was caused by a falling star, a story which conceivably harks back to the ancient star-worshipping religion of South Arabia. From an eminence near by I took bearings on the peaks of Halaniya Island of the Kuria Muria group, lifting above the mirage. A northerly wind made the air chilly, and I presented the incongruous combination of cold chapped hands and an overcoat, together with an unrecovered sun-skinned nose and sun-cracked lips acquired with the intense heat of Wadi Anqau a week before.

The Bautahari, who was brought along to Lahit, was of great interest, differing in physical type and language from the Harsusi and from the conventional Arab badu, and I made a list of his words and a few inadequate head measurements. The latter pointed to his having a brachycephalic index. The tribal habitat extends along the coastal plain of Arkat into the Jabal Zaulaul as far as Ras Nus: it once included the territory as far west as Wadi Ara, which now belongs to the Mahra later-comers. The Bautahara, then largely Badawi, are to-day predominantly shark fishermen, using the primitive method of an inflated sheepskin already noticed. Like the Harasis, they are subordinate to the Janaba, but unlike them, they are ignoble, and with them no other tribe will marry.

The repellent dreary steppe of Arkat, through which our journey was taking us parallel with and some 15 miles inland from the sea-coast, was relieved by the blue mountains to our left front of Zaulaul and Samhan. In the late afternoon we got a distant glimpse of the blue sea below us, this mountain system sharply ending in a series of beautiful promontories, and I was able to take cross bearings on Ras Hasik and Ras Nus. Coming along we had caught sight of a party of four camel-men in the far distance. They halted and took stock of us. Suddenly they turned and bolted, like a wise minority. In the approved manner, Hamuda, my rafiq, went after them at a hot pace, shouting and waving his "musur," while we continued our leisurely course. But they were untrusting, and Hamuda gave up the pursuit disappointed, though he confessed that the abuse of the "white flag" is known. On reaching the point where we had seen them, we passed piles of recently cut "hadhaf" grass, which indicated our fugitives to be locals collecting material for rope-making. They, hidden by a distant fold and seeing us pass harmlessly on our way, must have formed a more favourable estimate of us, for they came galloping up from behind, and we halted to exchange greetings. They were Bautahara, but in appearance of a still different type from the fisherman at Lahit.

Towards nightfall we turned north, rather out of our way in consideration of our camels. The camel date rations had come to an end at Jazir, and the

Wadi Ara

Wadi 'Ainain

Mautbikhun pass, near Andhaur

Trilith monuments

Meadows in the Qara Mountains

Frankincense tree and Mahri collector

wretched beasts, depending upon grazing, had had for the past day or two almost nothing to eat. During the latter part of this day we made little progress, the Badawi halting at every tuft of camel thorn which the beasts snatched at and devoured hungrily. We camped under a cliff in Wadi Muqarrad, where we were screened from the north wind, and where the soft "masila" bed was likely to be more fruitful of camel fodder than the hard "sih" of yesterday's camp. This point marked the end of Janaba territory. It also marked an interesting watershed division. For all wadis to the east of it were sloping from the direction of Rub' al Khali southwards to the sea. From this point westward, on the other hand, wadi beds were sloping northwards from the mountains towards the Rub' al Khali. We proceeded between steppe and mountain, sometimes threading our way through the mountain fringes. The steppe, dipping away to the north, would appear to be inclining east to west upwards from Jaddat Harasis. The aneroid reading at a point 50 miles from the sea in the 55° of longitude measured 1500 feet. From the plain at this height the serried hills to the south rise from 3000 to 4000 feet in Jabal Samhan, the knee-shaped mass behind Kuria Muria Bay, making apt its name of Rakibit. From this intramontane plain I had reached, there are two main wadi systems flowing north, Wadi Ara and Wadi Andhaur, and into one or other of these all the wadi beds that hereafter lay across my path were reported to enter in the steppe. They are utterly dry, and have never been known in spate. Qaharait, Ghanawauk, Banat ar Rughaif have zigzag courses amidst low smooth conical hills, in places white with salt efflorescence. Damait and Haradhu, where I crossed them in the plain, were wide, shallow, and pebbly. Ara, one of the most imposing, has a great width of pebble bed, and we arrived in it after ten hours in the saddle, to camp beneath yellow cliffs facing west. Its scant vegetation must be sustained by dews, of which we had a particularly heavy one that night, and I saw here a bush called "al ashkhara," for the first time on my journey, though it is very common in Northern 'Oman, where its ash is used as an ingredient of gunpowder. The camels were getting very tired, having had little food of late, and no water for six days since leaving 'Ainain, and this made their owners fretful. We ascended the small steep Wadi Khungari—report extinguishes it a day's march north—and at the top were rewarded by a glorious panorama view of Wadi Andhaur, its pebble bed a white ribbon below us. Descending, we turned up a wadi tributary, and both here and where it joins the main valley gorge, came upon archaic ground monuments of the kind already noticed. Here, however, I discovered for the first time that some of the stones had rude Himyaritic characters scrolled upon them. These I copied hurriedly, as the convoy had gone on for much-needed watering. The water of Andhaur has a sweet taste but an evil reputation. "It causes fever that kills," they told me. I was soon to discover the cause when a mosquito, the first I had seen since Ja'alan, buzzed in my ear, and the only inhabitant of the place, a Bait ash Shaikh tribesman, came to me with a large spleen and malaria symptoms. Two Mahra shaikhs had also recently been there. They had been sent by the Governor of Dhufar to escort me, had halted over the well for a fortnight until their food ran out, and then returned. Dhufar was reported to be full of evil forebodings about the fate of my expedition. There was news, too,

that raiders were about, some Mahra having recently suffered at the hands of Qurb and Nahad tribesmen, to the extent of one man and three camels. This supplied a justification for the precautionary measures of my Badawi of late in lighting no fires at night. The way out of Andhaur was by way of the steep pass of Mautbikhun, 300 feet high, and to negotiate it all had to dismount. This led by a difficult pebbly bed into Qirina, whence rolling country with scant vegetation, skirting the mountain system to the south-west, brought us to Wadi 'Afar.

An hour short of the wadi we saw the "mghur" (frankincense tree) for the first time, in appearance a young sapling, with no central trunk, but a clump of branches springing out from near the ground, ash-coloured bark, and studded with diminutive crumply leaves. Local camels will eat these leaves. Hamuda dismounted and brought a specimen of frankincense (liban) in the raw condition on his dagger-blade for me to see; it resembled lard of a green transparent colour, and was very fragrant. The process is that the collectors—women as well as men—make a slight incision in the bark from which the sap exudes, and a week later they return to scrape off the dried resinous substance, pear-shaped and aromatic, and send it to the coast for export. In ancient times this magical produce was used by the Egyptians in the process of mummifying sacred bodies. It still serves a religious purpose, but is now sent east to the temples of India.

As we approached Wadi 'Afar we saw some camels couched there, when suddenly a rifle-shot halted us. Hamuda, the rafiq, went ahead to investigate, and came back with the information that all was well, but that he had been covered by a rifle throughout his explanation. Mutar, the marksman, had, it transpired, some years before murdered his cousin for supposed witchcraft, a common affair, and still regarded all with a hunted and suspicious eye.

This word 'Afar may mean either "red" or "clouds" in the Hadara languages, and in consequence it appears to me to have given its name to the entire province. Thus Dhufar = Dhu Afar is susceptible of two meanings, "The red country" or "the cloudy country." Local conditions satisfy either meaning. With some Dhufar has been equated with Ophir.

We turned out of the red-banked Wadi 'Afar, rich in many varieties of camel thorn, and where the flat-tailed lizard is again common, and passed through a magnificent natural orchard of frankincense trees 4 miles square, in country chiefly stony with patches of black lava. Beyond, a wide plain reminding me of the Jordan valley, opened on its far side to the entrance to Wadi Dhaghaub, where we halted for the night. A Mahri joined us, and from him I elicited the whereabouts of archæological remains in the neighbourhood, such as those I had met with; so the following morning he and I set off on foot up valley, having arranged to be overtaken by the caravan. At the foot of the white slopes were many curious detached rocks of mushroom shape and giant size, worn thus by a process of denudation of the softer rock below. At the top of the ridge we halted to investigate more of these typical ground monuments, some very well preserved but none inscribed. Here was another fine large wadi plain, Dhahibun, running north to join Andhaur. Bearing to the left we turned into Wadi Dhikur, a tributary of Dhahibun, with white hills whose general conical appearance seemed spoilt by a characteristic square excre-

scence, and whose sides were pitted with caves. Here at the entrance was a considerable collection of ground monuments, one or two inscribed, but they paled before the innumerable archæological remains higher up the Wadi Dhikur, whose slopes above a fairly wide valley were clothed with "mghur." Very soon we entered a magnificent gorge, its red cliffs towering 400 to 500 feet above, recalling Petra to my mind. Its steep winding ascent of white pebbly bed was impeded by monstrous boulders. At 2300 feet we came to an impassable blank wall, below which was a sunken pond of green pestiferous water. High above us Qara and Shahara tribesmen, strange to behold and armed with sword and buckler, swarmed down the precipitous cliff face, their shouts reverberating down the valley. These types I was to encounter from now onwards across the Qara mountains to Dhufar. They were as distinguishable from the Harasis and Bautahara as from the Mahra.

From Jaddat Arkad to this point, the Eastern Marha claim a different ancestor from their fellow-tribesmen to the west, one Bir Bauki, and they are known to Arabs as Hasarit.

Returning to the open Wadi Dhikur, I was welcomed by three Qara shaikhs of the Bait al Ma'ashani, and on the morrow I pressed on in their company on foot, sending the camels by an easier path to await us on the road. We first passed up the south-west slopes of the valley. A climb of 500 feet brought us to a point giving a commanding view behind us of the Mahra steppe country stretching north well into Rub' al Khali. Riding on through undulating country with occasional rifts showing salt efflorescence, brought us into higher jungle country, in which grew a libaniferous shrub inferior to frankincense, called "tishgaut."

Here a rescue party from Dhufar met me, and we pressed on, growing in numbers, with additions of tribesmen actuated by curiosity, who kept up a cheerful chanting. Proceeding south "tishgaut" gives place to frankincense, and the place where the divide is reached is called Qata. Behind is the rainless arid desert. Ahead, meadow country of the seaward slopes and the coastal plain of Dhufar, which receive the bountiful three-months' summer rainfall of the south-west monsoon. Here, too, is the boundary between the Mahra and Qara tribes. The former are poor Badawi; the latter settled and rich, possessing large flocks and herds and camels.

Proceeding down a valley commanding above it a delightful view of distant hills, spacious and well wooded and recalling parts of the Lebanon, we came to a halt at the Qara village of Dharaitum enclosed in an amphitheatre of hills. Here low hive-shaped straw huts sometimes mark the entrances to caves, for the Qara are largely troglodytes. A howling gale during the early morning hours blew my tent down in a heap about me, and I was driven to take refuge in a small cavity under some rocks, leading down between sycamore slopes from the valley. A natural cave high up the hill, with an entrance 8 feet wide, penetrates to 60 feet. At the top, above it, were rolling yellow meadow-lands, with cows everywhere grazing, and an occasional clump of trees almost suggestive of an English scene. Low driving clouds prevented us from seeing Taqa, our destination, that night, but we got glimpses of the Indian Ocean beyond and the lofty blue range of Samhan to our left. Descending, we reached Shihait, a grass-hut village of the Shahara tribe, a comparatively fair race of the

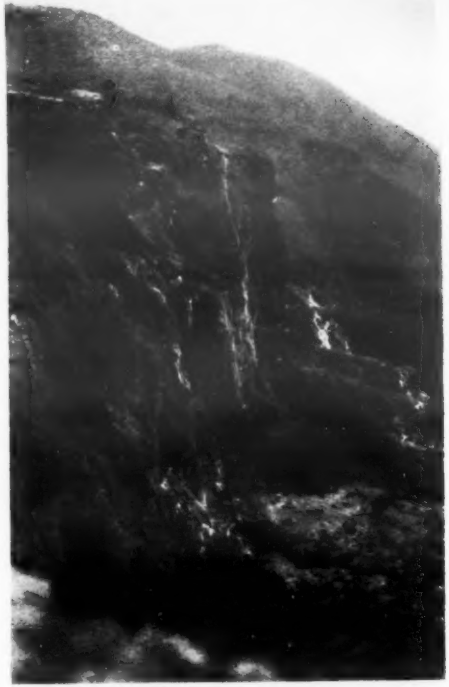
highest local antiquity, who are now despised and the mere hewers of wood and drawers of water for the Qara. Curiously, the Qara tribe speak Shahari, which suggests that they adopted the language of those whom they dispossessed.

I was anxious to see the abyss which Bent had identified with Abyssapolis, so thither (the locals called it Dahaq) I was conducted, the camels having been sent round by another way to the foot of the precipice. Descending steeply, we halted 300 feet above the gorge of Darbat, here a perennial stream. The spectacle is of great beauty. In every direction are mountain slopes thickly wooded, and below the stream flows towards the abyss. We clambered down the hillside to this stream, where the Bents had penetrated from the coast thirty odd years before. Thence I crawled to the edge of Dahaq, a precipice a mile in width, its eastern end marked by a delightful cascade, and peered down its precipitous face 500 feet below. Descending by a flanking slope we followed its winding bed to its mouth, Khor Ruri. The ruins hereabout, Husn Mirahadh, and the barred entrance of Inqatat (Bent's Rhatiya) are probably the site of Moscha of the Periplus, Ptolemy's Abyssapolis, as suggested by Bent, from its proximity to the Dahaq. Miles's identification of Moscha with Hasik, 80 miles to the east, despite the reported existence of ruins there, is, I think, a less happy one. Certain it is that Arab geographers give Murbat as the site of the ancient seaport and capital of Dhufar, which lasted until fourth-century Hejra. Now the present ruling Shaikh of Murbat, situated 20 miles to the east, who accompanied me to the ruins, volunteered the information that this was the site of ancient Murbat. Further, I elicited from a Shahari that the word for Murbat in his dialect is "Sik," a word that would appear to preserve the important radicals of the name Moscha. On the other hand, the ruins are by no means the most extensive or imposing in the Dhufar plain, where Al Balid, Raubat, and Taqa might be mentioned. Bent links up the characteristic short monolithic column, of octagonal shaft and square corbelled capital, with those at Adulis on the Red Sea, and at Aksum in Abyssinia. His descriptions of the sites and remains are not exhaustive, and what he terms sarcophagi are, I think, only water-tanks. Balid, the most imposing of these sites, has however been fully described in a paper given to this Society in 1846 by Carter, the Surgeon of the Indian Naval brig *Palinurus*. In the short time at my disposal I made measurements of the monuments I saw, and slight drawings of the decorated capitals and bases.

This coastal plain of Dhufar, through which my journey now ran, calls for no description from me, as Bent has already fully described it. I arrived at Salala, the capital, on February 16, having completed the camel journey from Suwaih, a distance of 650 miles through the southern borderlands to Dhufar, in exactly seven weeks. One hundred and fifty photographs, and the setting down of Badawi chants as far as European notation would allow, had provided some amusement in their acquisition. During my journey I collected a few fossils and other geological specimens. These my friend Dr. G. M. Lees has examined. I am informed by him that 'Oman may be divided into two separate geological provinces, a highly folded complex forming the Hajar Mountains, and a gently folded plateau lying to the west and forming the great desert plains and the greater part of these south-eastern borderlands.

Ruins at Raubat

Qara tribesmen



Dahaq—The Abyss

Salala, the capital of Dhufar

Wadi Darbat

Welcome by Governor of Dhufar

The intense folding of the former element took place in Middle Cretaceous times. A period of erosion followed, and in the Upper Cretaceous and again in the Eocene times marine transgressions took place, and a series of conglomerates, marls, and limestones were deposited unconformably on the older rocks. The western boundary of the earlier folded belt is obscured by this unconformable series, and it is only in isolated localities that the older rocks appear.

The southern borderlands through which I passed were formed of a great sheet of limestones and marls ranging in age from Upper Cretaceous to Eocene, and lying for great distances absolutely horizontal; elsewhere they are gently folded, giving rise to undulating country. Where I have recorded dark volcanic rocks, these probably belong to the older folded complex appearing from under its unconformable cover, as they are known to do at Masira Island and Ras Madraka. The discovery of red and purple slates near Wadi Nakhr appears to be of great interest. No such rocks are known in the Upper Cretaceous or Eocene, and if they belong to the older series it shows that the latter extend much farther to the west than was known previously.

The ancient basement rocks, granite, gneiss, etc., of the great Arabian tableland, appear at Murbat, in the Dhufar Province. They are overlain by a massive red desert sandstone formation, which is in turn overlain by Upper Cretaceous and Eocene limestones. The latter form the scarp of Jabal Samhan, and may account for the undulating plateau type of country farther north. Some of these gorges may have cut through the limestone series and exposed the sandstone formation below.

The other scientific results of the journey may be summarized thus:

(1) A map of South-Eastern Arabia.

(2) The discovery of two hitherto unknown tribes—Harasis and Bautahara —and their dialects.

(3) The compilation of four new vocabularies: Mahri, Shahari, Harsusi, Bautahari, the last two new to knowledge.

(4) The discovery of:

(*a*) Early pre-Islamic graves, chief among them the "trilith" type, preserving probably a survival of the Sabæan trinity of sun, moon, and star gods;

(*b*) Archaic inscriptions from these monuments.

The Wadi Dhikur seems to have been the popular burial-place throughout the ages, and this is suggested by its name, which may be translated "Valley of Remembrance." Besides the Muslim cemetery, three different types of pre-Islam graves (at least they are non-orientated) suggest three cults or races. One of these is rock burial. The north-east ridge of the valley is honeycombed with small cavities wherein the dead have been laid, and the outside bricked up with loose small stones. Another type, if grave it be, which I saw here for the first time, but which I met again later in Dhufar plain at Khor Ruri and Khor Suli, consisted of large flat slabs of undressed rock about 3 feet high, set up on end to make an oval of enormous size. The largest I saw measured 16 paces long and more than 6 paces wide; the black weathering of the stone suggested great antiquity. Sometimes this type was found in a

clustered rosette series. But the most widespread and interesting type was the ground monument I first saw in Wadi Sarab as far east as 58° long., and some of the later specimens of which in Wadi Dhikur were inscribed, though this was not known to the inhabitants, all, incidentally, illiterate, who marvelled that the rude inscriptions were the work of man—perhaps their ancestors—when I pointed it out to them. This monument consisted of a system of triliths, three elongated blocks of undressed stone (or sometimes round boulders with a naturally smooth surface) about 1½ feet high, standing on end and leaning inwards with their tops touching to ensure stability. These triliths were set up in a series along one alignment, each pile standing equidistant from its neighbour, about one and a half paces. Sometimes the trilith had a fourth and smaller stone superimposed, and occasionally a series of triliths was enclosed by an elliptical line of small pebbles. The series varied in number. I found them of 5, 7, 9, 14, and 15 triliths. Running parallel to each series, at about 3 paces distant—I now speak of those trilith remains I met with in the later stages of my journey—was a smaller series of large conical rubble heaps, modern equivalents of which I have seen elsewhere used for the kind of cooking known to Arabs as "mashuwa," a method of grilling flesh on heated stones. These I suggest had some sacrificial significance. Some of the smaller series of triliths, *e.g.* those of five in number were without them: the longer lines had these sacrificial piles in the proportion of one to three or four triliths. Between the two were sometimes small square boulders which had no obvious function, unless they were used as stools to sit upon. These monuments had no common directional orientation, but wherever found were aligned with the axis of the Wadi. Most were entirely without inscriptions, certainly all the eastern ones. Inscribed boulders were first met lying near the monuments in Wadi Andhaur, but in Wadi Dhikur they were found as the headstone of one of the terminal triliths. The inscriptions were generally separate characters 1½ inches in size, rudely done, and having a dotted superficial impression which suggested that the implement used in their making was a nail-headed flint hammer. Transport limitations prevented me from bringing back more than one specimen of this work. This appears to represent a camel. I have presented it to the British Museum. On account of weathering of the stone, a great many of the inscriptions were unrecognizable. Those that were better preserved I copied in full, and of one I made a squeeze. Dr. Neilson of Copenhagen has undertaken their examination.

The places where these monuments were found are shown on my map as follows: Wadi Sarab, W. 'Ainain, W. Banat ar Rughaif, W. Haradha, W. Andhaur, W. Dhaghaub, and W. Dhikur. It is in the last two places, however, that they occur with great frequency and are inscribed, particularly in W. Dhikur, where there are long lines of them in parallel groups.

With regard to my map, I am conscious that the geographer looks dubiously upon the red line of a route. But remembering that this region of Arabia is such that Bent wrote of it: "In this way we should avoid a stretch of desert which the Bedouin themselves shrink from, and which is impassable to Europeans,' and that Admiralty instructions warn mariners of its barbarism, I crave a certain indulgence. Except for the first two days, and in the neighbourhood of Khaluf, when expediency made it necessary to conceal my instru-

ments, I used my prismatic compass, watch, and diary, barometer and thermometer, throughout with assiduity. From time to time I was able to check my traverse by compass bearings on the fixed positions on the Admiralty charts.

It is necessary to record that from Wadi 'Ainain westwards, Arabic names have been used, whereas in each locality local dialectic variations are also in use.

If my journey be regarded in three stages, coinciding with my camel relays, part of the second and the whole of the third stages, *i.e.* from Wadi Sarab, lat. 20° 10′ long. 57° 45′ E. to Salala, lat. 17° 00′ long., 54° 06′ E., may be regarded as the habitat of the group of non-Arab tribes. These, the Harasis, Bautahara, Mahra, Qara, and Shahara are in appearance racially distinct from the usual Semitic Arab, and from one another. Moreover, they are conscious of the distinction. Their languages, though Semitic in structure, are not understood by Arabs, nor by each other; having some affinities with Ethiopic they are probably related, and may be anterior to Himyaric. They are not written languages. Four in number, they appear to belong to two distinct categories: (*a*) Shahari, spoken by the Qara and Shahara; (*b*) Mahri, Harsusi, and Bautahari. The three latter, from a comparison of their vocabularies (and I collected 500 words of the first three, less of the fourth) appear to have a common origin though they are regarded as being quite distinct by their users, who are mutually unintelligible one to the other when they wish to be. Two of these dialects, Mahri and Shahari—at least as they are spoken in Western Hadhramaut—have been extensively written up by Dr. Maximillian Bittner from the material brought back by the Landberg and Muller Expeditions of 1899 and 1902. My word-lists of these two tongues, having been collected in a different region (I was not aware of the German work at the time), may have dialectic differences. All four have in common an aspirated "l" as met with in Welsh, and Shahari has a nasal "n" and, in addition to the Arabic sound values, a "p" and a "g." It is of interest to note that the region occupied by these tribes is, to the Arabs of Ja'alan, known directionally as Hadra; by them, too, the Arabian Sea bordering these coasts is called Bahr al Hadri, and finally the group of tribes of the Central South—excluding only the Qara—is known as Ahl al Hadara. I therefore suggest the identity of the word either with Hadoram of Genesis or Adramitæ of Pliny.

What and whence are these tribes? The conception that Arabia is peopled by one race has little justification beyond political uses. In this south-eastern corner of Arabia—I quote Sir Arnold Wilson—"three races of primitive man first met, the Dravidian, the Eur-African or Hamitic, and the Mongoloid stocks." The Arabian littoral was probably in Persian occupation for a thousand years from the age of the great Cyrus down to Islamic times. The 'Oman Qahtani immigrations into 'Oman—whatever the Qahtanis were—came from Yemen in the second century A.D. I had already observed a sharp distinction between the dark-skinned Yal Wahiba of the southern littoral and their fellow-Badawi tribesmen of Northern 'Oman, and on arriving amongst the unique group of tribes occupying the mountains of the Central South, I felt that here were uncontaminated survivals of early races.

At the dawn of history South Arabia had settlements of the Sabæans dotted about it. Inscriptions of the earliest period are sometimes known as Minnæan, but whether this term is racial or merely linguistic is unknown. The Sabæans

were in due course overthrown by the Himyarites, and these in turn were absorbed by the Arabs. Are the tribes of my journey one or other of these? Or are they descendants of African invaders into Arabia, for history records an Abyssinian invasion of Arabia, and it is reasonable to suppose that there were others in prehistoric times? It is interesting, too, to remember that the Queen of Sheba (Sabæans) is claimed both as an African and an Arab queen, and it is not improbable that the same race was found on both sides of the Red Sea. Be that as it may, these tribes—with the exception of the Harasis—have a tradition of an African origin, the order of their local antiquity being Shahara, Bautahara, Mahra, Qara. They are not, however, negroid. They have many customs which are not only peculiar to themselves, but the exact opposite of those of their neighbouring Arabs of 'Oman. Circumcision is one. With this group female circumcision, which is a major operation, takes place on the day of the girl's birth, and adult male circumcision is practised when the boy is about fourteen years old. In 'Oman female circumcision is a slight operation carried out when the girl reaches the age of ten, and male circumcision takes place when the boy is about six. With the Qara death is accompanied by wholesale sacrifice of animals, cows, camels, and sheep, and the flesh is given to the poor—the survival, it would seem, of a cult of propitiation. With them the cow is greatly reverenced; no woman is allowed ever to touch its udders, and its sacrificial value is seven times greater than that of a camel, though the latter is intrinsically the more valuable animal. With the Arabs of 'Oman, on the other hand, the cow is a degraded animal; its very name "buqara" is never mentioned in polite society; women do the milking, and no man would demean himself by such an operation. With the tribes of the Central South, ordeal by fire is universal; sheep are milked into a receptacle into which a heated stone has first been placed, and there are two breeds which may only be slaughtered after nightfall. Spirit exorcism is practised by Bait Shaitana and Bait Qawas, and there are other unique customs. The details of these I have described fully in a paper which I recently gave at Oxford to the Eighteenth International Congress of Orientalists, and which I understand will be published in the *Royal Anthropological Journal* for June.

On the evidence of physical characteristics, tribal tradition, customs, and head measurements, I have hazarded the suggestion that these tribes may be of Hamitic and not Semitic origin. Dr. Rathens, a German adviser to the Imam Yahya of the Yemen, favoured this view on the score of types he had seen farther west; and Dr. Neilson, the Danish scholar, informed me that Glaser strongly held the view that Hamitic survivals should be expected in Southern Arabia.

I wish to acknowledge my indebtedness to Lieut. D. H. Secker, R.N., H.M.S. *Triad*, and Lieut. K. Mackintosh, R.N., H.M.S. *Crocus*, for their assistance in (1) Remedying defects in my sextant at the outset; (2) adjusting chronometer error and working out some sights at the conclusion of the journey; also to my Arab secretary Ali Muhammed Effendi, without whose unstinted labours the task of compiling strange vocabularies, through the medium of Arabic, would have been beset by pitfalls.

DISCUSSION

Before the paper the PRESIDENT (Colonel Sir CHARLES CLOSE) said: Mr. Thomas, who is to lecture to us to-night, is the Financial Adviser of the Sultan of Muscat, and is a student of ethnology and of languages. He is to describe to us the south-eastern borderlands of the Rub' al Khali, the great southern desert of Arabia which has an area of some 250,000 square miles. It may be approached perhaps most easily along the southern coast of Arabia, along that great length of about 1000 linear miles which stretches, roughly, east-north-east from the neighbourhood of Aden. That great desert has never been explored, but its borderlands have just been touched. There have been a considerable number of travellers who have, since 1835 and onwards, entered on the outskirts of the desert and have learnt a little about it. The first in that neighbourhood were two naval officers, Lieutenants Cruttenden and Wellsted, who in 1835 were allowed to leave their ship and do some exploration near the coast. Von Wrede was in the neighbourhood in 1843, and Colonel Miles in 1876; in 1893 Hirsch was there, while the remarkable journey of Mr. and Mrs. Bent was made in the same year. Then quite recently we have had a very excellent account of the geology and physical geography of South-Eastern Arabia by Dr. Lees, and that account gave us some idea of the complexity of the geological conditions. We also had, a year or two ago, a lecture by Major Cheeseman, who approached that great desert from the north in 1923.

Now Mr. Thomas is going to describe to us his attempts—and very successful attempts—to get into touch with a part of the country we know so little about, and I ought to say before I sit down that Mr. Thomas went, not as an official, but privately. He lived as the natives in that country do, I understand somewhat uncomfortably—no tobacco and no alcohol. I commenced by saying that Mr. Thomas was a student of languages and an ethnologist, and if you add to that that he is a geographer and that he has studied under Mr. Reeves in this Society, I am sure you will realize he has ample qualification for the task which he set himself.

Mr. Thomas then delivered the lecture printed above, and a discussion followed.

Sir DENISON ROSS: I have attended many delightful lectures in this hall, but never before has the Society been so hard up for speakers as to call on me! I do not know why I have now been called on, but I can only say that as the lecture went on I became more and more thrilled, because nothing could interest me more than to discover that the country of Mahara and Shiha contains people who are probably totally different from the Arabs and most likely non-Semitic. That is perhaps the least-known part of the familiar and near world, as far as Europe is concerned.

It is a curious thing that the main body of the Hyderabad contingent of cavalry was recruited from that strange land, and the Mahras were the finest cavalrymen in the Hyderabad contingent which took part in the campaigns in South Africa and Egypt long before the Great War. At any rate, the history of the connection between Abyssinia and Arabia has yet to be gone into. The Red Sea lies between them. We all know that even with our 50,000-ton steamers we are cowards at sea to-day, but in the past people frequently went from the coast of Arabia to China in boats of 20 to 30 tons and thought nothing of it till they reached their destination—and still less if they did not!

The connection between Abyssinia and Arabia is a very curious one. When we think that apart from the inhabitants of the country of whom the lecturer has spoken who were obviously quite different from the Arabs who supplied troops to a European army, and when we think that during the fifteenth and

sixteenth centuries some of the greatest leaders and generals in India were men who came from that country and from Abyssinia and the islands of the Red Sea, we realize that we know very little of the world about which we think we know so much. What I would like to see is an expedition conducted into that country which has received so little attention. It is ridiculous to think how little we know of the Rub' al Khali—that big empty space in the Near East. We have aeroplanes, motor cars and submarines—even these might be useful—and this huge expanse of unmapped country. Who knows that we may not, if we explore it, come across an enormous population speaking a language nobody has ever heard, or even possessing a literature? Why should the Rub' al Khali, which means "empty quarter," remain empty?

Sir PERCY COX: It is nearly thirty years since I was in the part of the world Mr. Thomas has been telling us about, so that I feel rather a fossil, but I can throw a little light on one or two points. On one occasion I travelled from the Trucial Coast, along the back of 'Oman, and then down into Muscat, via the Jebel Akhdar Range, the crest of which is a plateau about 7000 feet high and from 30 to 40 miles long. From that elevation I probably got a better view than any one living has had, of the Rub' al Khali from the east. I could see the Wadi Halfain and the Wadi Andam emerging from the foothills of the central range and winding out into the desert until they were lost to sight.

Twice I just touched the fringe of the Beni Bu Ali country. On one occasion the Sultan (father of the present Ruler) had received some small pieces of coal from this part of the country and thought it possible that coal-mines might be developed in his territory. I was then Agent to the Government of India, and the Sultan asked, through me, if this piece of territory could be examined for coal. I was accordingly deputed, with a geologist, to go and try and get some samples. We got near the place, which was about three days' march inland, but there we were held up for six weeks in the middle of the hot weather, endeavouring to get through to the coal-bearing hills. I was quite determined to get there, but finally I had to wait for the Sultan to come down and square the unruly shaikhs, and we were at last able to go on. We continued, however, to meet with extraordinary difficulty and obstruction, and finally the geologist and I were only able to dig one bag of coal, and being sniped all the time! We agreed that it was not quite a favourable atmosphere in which to geologize, and got away with our bag. It proved to be quite good coal; but in face of the lively objections of the Arabs of that part of 'Oman to foreigners coming into their country and the absence of practical communications it has not been commercially possible to export the coal. I tell you of this experience in order to make clear what a difficult task it is to travel in that country, and how much credit is due to Mr. Thomas for carrying through the journey which he did.

I have been very sorry to hear recently that his two chief friends, the Shaikhs of the Beni bu Ali and Janaba, have since got into trouble with the Government of India and are under a cloud, so that it looks improbable that Mr. Thomas will be able to get back to that locality as one hoped he would. He is to return to 'Oman in a few weeks' time, and I know he would like to continue his exploration work, but I fancy he will have to look at the Rub' al Khali from a different point.

I mentioned that it was nearly thirty years since I was there, and at that time there were none of the amenities that Sir Denison Ross has referred to. I then had ideas myself of probing the Rub' al Khali and discussed the problem seriously with some friendly Al Wahiba Shaikhs, the possibility of crossing from Muscat to Aden. They were confident that it could be done, as far as they were concerned, provided one had a good bundobast for relays of water;

but they feared what might happen from the tribes they would meet on emerging the other side, and suggested that I should go round to Aden and cultivate the tribesmen on that edge of the Rub' al Khali and bring some of them back to Muscat so that they could accompany us across. I give Mr. Thomas that tip for what it is worth.

I was interested to hear Mr. Thomas's explanation of the word "Dhufar." We had a lecture a year or so ago before another Society, in the course of which it was suggested that Dhufar was a contraction of "Ed-Ophir," the "ed" being a local form of the Arabic article "el"; but I then expressed the opinion that such an explanation would not bear examination (from an etymological point of view). I think Mr. Thomas's suggestion that the word may well be "Afar" with the Arabic prefix "Dhu" before it, which would give the meaning "Red one," and be equivalent (to any here knowing Hindustani) to "lal-wallah," referring to the general red colour of the landscape, is quite a reasonable one. But if he is able to get to that part of 'Oman again I hope he will go specifically into the question of the site of Ophir which has puzzled geographers for so many centuries.

As regards the Rub' al Khali, it seems to me that before anybody attempts to trek across it we need to fly over it. I cannot believe that there is anything important in it, because nothing whatever comes out of it; but it would be a great advance if we could fly over it so as to see generally if it is pure desert, or whether there are oases in it, as of course there may be.

The PRESIDENT: We congratulate Mr. Thomas on the skilful accomplishment of his very difficult journey and thank him for the account he has given us. We are sure that he has added materially to our knowledge of that little-known country. I was interested to hear his remarks as to the lack of rain there. A friend of mine who was in a desert part of Africa remarked to a shaikh that as there were so many heavy clouds it was probably going to rain, whereupon the shaikh said that it was not likely to; in fact, it had not rained for thirty-seven years! Mr. Thomas described the country where the frankincense grows, and how many of those who use incense—as some do in England—have to use a commercial substitute, which is, as a fact, sandalwood. That ought to be brought to their notice. And talking of incense reminds me of smoking and that in the printed proof of his lecture Mr. Thomas says that those who smoked amongst the puritan tribes were beaten until they repented. That is not at all a bad idea. We thank Mr. Thomas very much for his lecture

LIBERIA AND THE BELGIAN CONGO: *A paper read at the Meeting of the Society on 21 May 1928, by*

GEORGE C. SHATTUCK, M.D.

THE Harvard African Expedition of 1926–27 was organized and led by Dr. Richard P. Strong, Professor of Tropical Medicine of the Harvard Medical School. The objects were to make a medical survey of Liberia and to study the tropical diseases of the Belgian Congo. Liberia was less known from the medical standpoint than any other country in Africa. In addition to the medical staff special personnel was engaged to provide for zoological and botanical collecting. With us went Dr. Joseph C. Bequaert, entomologist, and Dr. Max Theiler, bacteriologist, both of the Department of Tropical Medicine; and Dr. Glover M. Allen, Curator of Mammals of the Museum of Comparative Zoology at Harvard. Dr. Allan was assisted by Mr. Harold J. Coolidge, Jr., and at times by Mr. Loring Whitman, whose special duty was photography. The botanical collecting was undertaken by Dr. David H. Linder. It was not considered practicable to include in the party, which already numbered eight, a man specially qualified for geographical studies. Geographical observations, consequently, had to be subordinated to other work. Many interesting notes cannot, for lack of space, be included in this account of a trip of a year's duration. Therefore I have attempted little more than an outline, and have laid emphasis upon Liberia at the expense of the much larger Belgian Congo, which is so much better known.

The purposes of the Expedition were achieved. Much important new information was obtained about the nature, prevalence, and distribution of disease in the interior of Liberia, and opportunity was afforded to study the human diseases of the Belgian Congo and to collect medical material of value for teaching. Diseases of the coconut palm, the rubber tree, and of young quinine plants were studied with gratifying results, and much was learned about the parasitic diseases of wild animals, especially in the eastern part of the Belgian Congo. Valuable collections were made of blood-sucking insects, animals, birds, reptiles, and plants. These collections have been taken over by the appropriate departments of Harvard University. Some of the data secured have already been published in journals devoted to science or to medicine, but an illustrated monograph now in process of preparation will bring together all that was learned by the Expedition.

The area of Liberia is believed to be about 43,000 square miles.* The interior of Liberia has not yet been surveyed, and such maps as exist seem to have been compiled largely from hearsay. The country is heavily forested, with the possible exception of a small area near the north-eastern border and in the neighbourhood of villages where much of the land is or has been under cultivation. Observations made near Monrovia by Taylor in 1913 show the rainfall in the western part of the country to be about 160 inches.† There are numerous rivers, but, with the single exception of the Cavalla which forms the southern boundary, they are not navigable because of falls or heavy rapids within 20 or 30 miles of the coast.

The so-called Americo-Liberian population governs the country. Most of

*Sir Harry Johnston, 'Liberia,' vol. 1 (1906), p. 2.

†R. C. F. Maugham, 'The Republic of Liberia' (1920), p. 277.

these people are the descendants of freed slaves from America. They are believed to number about 12,000, and are said not to be increasing. They are sustained politically by perhaps 40,000 Christianized and more or less instructed natives and persons of mixed race.

The indigenous population has been variously estimated at from one to two millions. It is divided into a large number of tribes, some of them speaking similar dialects; but there are several basic languages of different types. The Kru tribe has a large settlement at Monrovia and other villages along the coast to the south-east. Toward the north-west, and particularly in the neighbourhood of Cape Mount, is the territory of the Vais. They are the most intelligent of the indigenous tribes, are Muhammadans, and have a written language of their own which was invented about a generation ago. The best house-boys in Monrovia come from the Vai tribe. The Golas inhabit the interior not far from the coast and are in contact, territorially, with the Vais, and the Grebos live near Cape Palmas. The Basas, Mandingoes, Kpwesis, Mahs, Gios, and Bush Krus live in the interior and will be described later.

Through the courtesy of Mr. Harvey S. Firestone and that of the officers of the Firestone Plantations Company the members of our party were treated as guests of the Company while in Monrovia. This hospitality was greatly appreciated, not only because the hotel is rather primitive, but also because of the kindliness of our hosts. An introduction to the Liberian Government from the Department of State of the United States Government put us in touch with President King and with the higher Liberian officials.

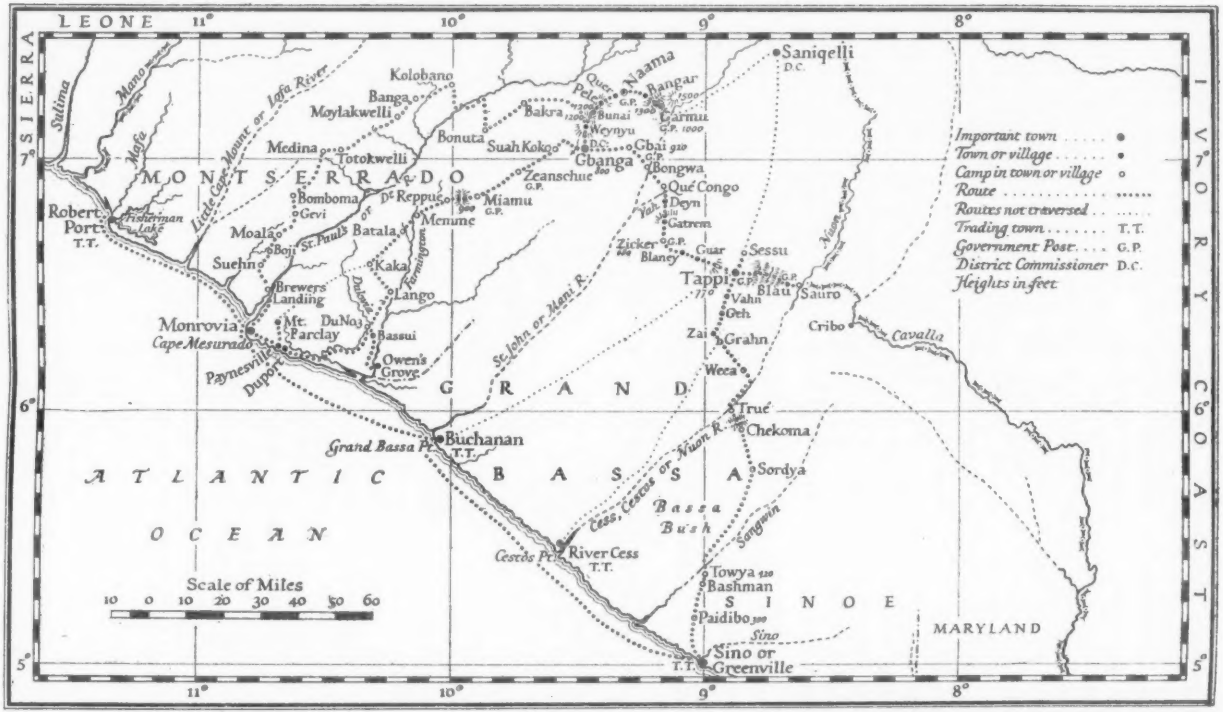
Most of the dwelling-houses in Monrovia are built of wood and roofed with corrugated iron, and, in general, shops and warehouses are walled with iron as well. The prevailing style of house reminds one of the smaller and less prosperous towns of the Southern United States. It is but natural that this should be so, for the ancestors of a majority of the inhabitants were slaves from the Southern States. Several streets are smooth enough for automobile traffic, but the cross streets which descend to the water-front, except one which has been graded and cemented, are impassable except on foot.

Medical examination of children at Monrovia showed that malaria and hookworm are prevalent there.

Near the town is a plantation of coconut palms, some of which were diseased. Examination by Strong revealed a condition resembling "red ring," a disease found in coconut palms in Central America, caused by a very minute worm. Worms of a similar kind were found by Strong, but they proved to belong to a new species. The disease is important because of the high commercial value of the trees.

From Monrovia to Plantation No. 5

The first base camp was made on one of the Firestone plantations on the Dukwia river about the middle of July. We were advised against going into the interior at that time because the rainy season was then in full swing, but we could not wait. Plantation No. 3 was reached by motor to Duport, where a canoe transported us down a small stream to the Company's launch which was waiting below. The launch continued downstream to the Junk river and



The route of the Harvard African Expedition, 1926, mainly from a compass traverse by Loring Whitman, and the map prepared by the Firestone Plantations Company

then up its tributary, the Dukwia, to the plantation, which was reached in the afternoon. A road has since been put through to the plantation, so that it can now be reached in a few hours from Monrovia by car. The canoe passed alternately through sombre forest and sunny glades where white Crinum lilies stood blooming in the water. Then came thickets of Pandanus palms rising out of the mud upon clusters of snaky roots. Their no less snaky branches end in spiral tufts of saw-toothed leaves. A Pandanus thicket is not merely impenetrable as is a barbed wire entanglement, it is unapproachable by day and terrifying by moonlight.

On the lower Dukwia in swampy ground a species of Raffia grows wild in profusion. From it is obtained piassava fibre, an important export, which is used for making brushes and brooms. Here and there, too, oil palms are seen. Higher up the river grow the forests of large trees. Most of them are leguminous and some have pods shaped like the sole of a shoe and large enough for a giant. The branches of the larger trees are tufted with epiphytes, and vines hang from them like rigging from the mast of a ship. These features of the forest are best seen where a native rice farm has been recently hewn out, exposing them to view. Where Nature has not been disturbed curtains of vines screen the forest from sight, but above it all spreads the great green feathery dome of the silk-cotton tree, or Ceiba. From this "cotton" is made the kapok which is used for stuffing pillows.

It is said that the great trees in some parts of the African forest stand 200 feet or more in height, but I do not think that the Ceibas of Liberia are as tall as this. The roots grow near the surface, and the trunk is buttressed against them, so that when a Ceiba is to be cut a platform is built around it perhaps 12 feet high to enable the choppers to get above the buttress. The trunk accounts for about two-thirds of the height of the tree, and the lower branches are nearly horizontal. I estimated the height of a large specimen, which had been felled, at about 150 to 160 feet, with the lower branches about 110 feet above the ground. Along the river the rattan palm recline against the forest wall, and there are several clumps of the giant bamboo which is supposed to have been introduced by the Portuguese long ago.

Plantation No. 3

At the Plantation camp medical studies of the labourers and of the inhabitants of neighbouring native villages, and zoological and botanical collecting, kept all hands busy there for several weeks. The discovery of a case of smallpox was notified to the Company's physician in Monrovia. The patient was isolated in a hut in the forest under the care of immunes who had had the disease, a campaign of vaccination was instituted, and no further cases occurred.

Exceptional opportunities for collecting botanical and zoological material were afforded by the felling of the forest which was proceeding near the camp. The labourers would bring in lizards, snakes, and sometimes small monkeys which they had caught. Among the snakes were several poisonous vipers. Owing to the fact that I had stored some rice in my tent, rats gathered there, and the noise they made at night became annoying. After a time I had several quiet nights in succession. The reason became plain when a tree cobra was

found under my bed. Although snakes were undoubtedly numerous in the forest, I did not often see one upon the trail.

The inhabitants of the villages near the Dukwia belong to the Basa tribe, whose huts are small, mud-walled, and thatched with palm. Rice and manihot are cultivated in abundance, and maize and bananas are grown as well. The people keep a few goats and fowls, but fowls and eggs were scarce and expensive, and goats were held at so exorbitant a price that the people evidently did not know the value of money.

The rice, which is of the dry variety, is grown on hillsides which have been cleared of forest. The crop ripens in August. The flavour of country rice is far superior to that of the best imported rice. The native women decorticate the rice by pounding it with the end of a heavy stick in a wooden mortar. Decortication is incomplete, so that the rice does not entirely lose its important accessory food factors, the vitamines. The Basas go practically naked and have only the most primitive arts.

While we were on the "Du," Coolidge engaged a semi-educated native who was recommended to him in Monrovia as an elephant hunter. This man said elephants had been seen recently at Lango, a day's journey to the east, and urged that a hunt for them be undertaken at once. Coolidge and I accordingly made an early start. We travelled light, covered about 16 miles by forest trails, and arrived at Lango early in the afternoon. There we were received with dignified courtesy by a middle-aged, intelligent-looking woman who, we were told, owned the village. She turned us over to a kinsman, who had the palaver kitchen, which serves as the village club or as a rest-house, swept for our use and provided with fuel and water. The square or oblong houses were clustered irregularly about an open space near the centre of the village. Our house was rectangular in shape, well roofed with thatch which effectively excluded sun or rain, walled to the height of 18 inches with mud and open above that on all sides. Here our cots were set up, nets hung from the rafters, and baggage deposited upon the flat top of the low wall. The open sides admitted every breeze but afforded no privacy. The people, however, did not manifest the degree of curiosity which became annoying later on in some of the other villages. They were friendly and quiet, their village was extremely clean, and the open space in which the "kitchen" stood was carefully swept every morning. These people, I think, belonged to the Kpwesi tribe.

At Lango we met men who had just returned from several days of unsuccessful hunting. They reported the elephants to be already far away. Accordingly, we spent the following day looking for buffalo about the neighbouring plantations. Fresh tracks were seen but no buffalo could be found. Finally, several red Colobus monkeys were killed for specimens and the meat given to the hunters—a reward which they appreciated. On the third day we returned to camp at No. 3.

The Kpwesi Tribe and the Mandingoes

Owing to the great number of loads of food and equipment needed for our large party it was possible to move only by relaying the porters. At Lango, a small and isolated village, it proved impossible to obtain enough porters, so that it became necessary to strike north to Kaka, the seat of a paramount

chief named Walker, and to obtain men from him. Walker rules with a rod of iron over a large territory including many Kpwesi villages. By employing as secretary a young negro who can read and write letters for him, he keeps in touch with the Government at Monrovia. Walker has at least thirty wives, and is obviously the richest of the native chiefs that we met. He wears a brown helmet and a striped blue-and-white cotton robe such as is made and worn by the Mandingoes. The houses at Kaka are large and well built. Some of them are whitewashed.

The Kpwesis are of medium height, often well proportioned, and generally brownish rather than black in colour. They are inferior in intelligence to the Mandingo, but are of distinctly higher type than are the Basa, the Mah, or the Gio; and they are cleanly in person. They were friendly and docile toward us, although some of them had put up a hard fight against the Government only a few years before. The wives of the more prosperous wear a bandana on the head and a strip of brightly coloured trade cotton draped about the hips in the form of a skirt. Necklaces and bangles are worn occasionally, and the bodies of some of the women are decorated with rather elaborate patterns of elevated linear scars.

The Mandingo women pick the native-grown cotton, card it, and spin it into thread. Some of the thread is dyed with indigo, which is probably of vegetable origin. The men weave the cloth with rough hand-looms which produce long strips of blue and white about 4 inches wide. These strips are then sewn together so that the garment appears to have been made from a single piece. This striped country cloth is heavy and very strong.

Most of the Mandingoes inhabit English or French territory to the north and east, but small numbers of them live in the Liberian villages or travel from place to place to trade manufactured cloth and bandanas for peppers and kola nuts. The Mandingoes are a tall and stately race having dark brown skins but Arab features. Some of them are handsome.

The Road to Gbanga

A road was in process of construction to Kaka from Monrovia, and it was hoped that President King might, within the year, be enabled to visit the town by automobile. This road is part of a military line of communication extending in a south-easterly direction through Gbanga to the border near Garmu and onward to Saniquelli. The work is being performed under the direction of Government officials or local chiefs at a number of points along the way. Where the ground is high enough to be dry there are many bits of road quite good enough for an automobile. Causeways have been built through some of the intervening swamps, and there are rustic bridges of small sticks over some of the streams, but these bridges would not support a car.

There are also a few hammock bridges which are suspended on ropes of vines, with a large rope to walk on and a rail-rope on either side. The three ropes are held together by a coarse netting of smaller vines or strips of bark. However, most of the swamps and some of the streams had still to be waded; and the water in August varied in depth from knee to waist. Rains were frequent in July and August. Sometimes they were so constant that it was impossible for several days to dry wet clothing; and, in order to have dry things

to wear in camp, it was often necessary to put the wet ones on again in the morning. One could keep warm enough walking, nevertheless.

Much of the road between Kaka and Gbanga, Gbanga and Garmu, and Gbanga and Gibi has been improved, that is to say, smoothed and widened, with the result that such parts are fully exposed to the sun. The heat from above combined with that radiating from the ground makes travel fatiguing upon "improved roads" after ten o'clock in the morning. From twelve to three the heat is intense if the sun is shining. Consequently, every effort should be made to start early and to travel fast in order to reach one's destination, if possible, before noon. Late starts were often caused, however, by failure of the porters to arrive early. The principal roads pass, as a rule, through abandoned plantations covered with a thick second growth which keeps off every breeze.

Suah Koko and Gbanga

Suah Koko is the village of a paramount chief of the same name, a powerful old woman, who took the part of the Government in the Kpwesi war. Being more or less blind now, she rules through a young grandson who does her bidding. She has no use for mirrors or cosmetics, but retains a great liking for gin and tobacco.

Gbanga is the headquarters of the Commissioner of the Second District. The Government compound stands apart from, but near, the town. It contains several large whitewashed buildings, mud-walled and thatched, in one of which the Commissioner lives. Others are occupied by men working for the Government. There is a large palaver house which we used as workshop and laboratory. Our tents were pitched in the compound in front of the building, and medical work and the collecting of specimens were prosecuted vigorously for a month at Gbanga.

The existing town of Gbanga was not shown on any of our maps. Probably it lies not far from where Suah is shown on the Washington map. Shortly before entering Gbanga we crossed a small river or large stream called the Jawquelli. The country round about has the same name.

At Gbanga there was a Kpwesi village and a Mandingo village side by side, each with its own chief. The Mandingo chief was a naturalized Liberian and had lived there with his people for many years. He was a large, fine-looking, dignified man, and he had a small white horse, one of the few that we saw in the interior. These horses are imported from the open country across the border. They soon die in Liberia, but we saw several nice ponies in Monrovia. The District Commissioner, Mr. Robert Clark, was helpful and obliging. He seemed to be an efficient administrator. A contingent of the Liberian Frontier Force was stationed at Gbanga.

The climate of Gbanga is distinctly better than that of the coast. The 800 or 900 feet of elevation freshens the air and gives cooler nights. The rain diminished in frequency while we were there in September, but increased again in October.

Hammocks of fibre netting dyed yellow and red and ornamented with tassels, and Mandingo leather wallets of skilful workmanship, and pretty grass-cloth bags are purchasable at Gbanga. A fair, or market, is held there weekly, and is attended by people from all the neighbouring towns.

Gbanga to Garmu

A side trip was made from Gbanga to Garmu, near the border of French territory, in order to learn the nature of the country and to check our position. The best road to Garmu describes a half-circle 40 miles in length, which leads through a number of large towns. Two abandoned "half towns" or small villages were soon passed, and after them Weynyu, a town of twenty or thirty huts. Weynyu was all but deserted, and the houses were falling into decay. In the afternoon we came to Pele, a fully occupied town of about fifty huts, and we camped at dusk in War Tar, or War town. The palavar kitchen was small, ill kept, and had been frequented by goats; but we occupied it without delay in the midst of heavy rain which continued most of the night. About 20 miles had been covered, but progress had been slow. One porter collapsed during the heat of the day at Bunai, from palm-wine the boys said, and the others were slower than usual, probably from having imbibed before starting.

A new town was being built at Bunai, where a local official delayed us, claiming that one of our porters was a runaway slave. Because we refused to give him up immediately, the local official sent along an armed man to bring back the slave. On his head the man wore a skull cap of long black monkey's hair which waved as he walked. A straight sword in a black leather scabbard hung from a strap which passed over the left shoulder, allowing the sword to hang horizontally beneath the arm. The left hand rested upon the projecting hilt. This Mephistophelian figure was tall and lithe, the features handsome, the expression proud, and the eyes restless and impersonal.

On this part of the trip we saw several dandies carrying swords encased in tasselled scabbards of red and black leather. Many of the women wore great brass bracelets about 4 inches wide and weighing not less than a pound. The surface of these bracelets was ornamented with spiral patterns in thick brass wire welded on. The workmanship was rude but the effect artistic. The bracelets must have been native-made. The scabbards, doubtless, were of Mandingo origin, for they resembled the leather wallets made by a Mandingo at Gbanga.

War Tar numbered about sixty huts, and Quer, only a mile farther on, about fifty. A little beyond Quer the trail struck into a broad highway running approximately east and west through Naama, forty minutes farther on. Probably the road came from Bakra. Naama is a large and important place, having about 100 huts and being the seat of a Deputy Commissioner of the Second District. Wishing to reach Garmu that night, we passed Naama quickly and soon came to Bangju, where a road gang was at work under an intelligent official. At a certain season, he told us, numbers of elephants crossed through this part of the country from the valley of the St. John's to the watershed of the St. Paul's, and that they came back again at another season. Only a few months before, an elephant had frightened the inhabitants of Naama by walking along the road through the town.

Not far beyond Bangju the road changed to a trail which led to Bangar (about fifty huts). This town was entirely surrounded by a fence, and the chief's compound was heavily stockaded. The old chief came out to meet us, escorted by a man carrying a chair in which the chief sat while the interpreters answered his questions. He wore a cap of brown fur and a dark robe.

From his neck was hung a large metal disc upon which was inscribed his name, and the statement that it had been awarded in 1914 by President Howard. No breath of air was stirring in the town, and the noonday heat was so stifling that we cut the palaver short and pushed on into the forest. Garmu was reached soon after 2 p.m., 20 miles having been made in about six and a half to seven hours of actual travel. At Garmu there is a small military post.

Our cots were set upon the verandah of a vacant building of the Post. The boys and the loads were accommodated inside. The boundary is shown on the map a little beyond Garmu. It follows a branch of the St. John's, to which Strong walked in the early morning while the rest of us shepherded the loads back along the trail. The ensuing night was spent at Naama, where a school teacher, the first we had seen, presented us with some magnificent cabbages of his own raising.

During the afternoon an exhibition of dancing was given by a group of girls under the direction of two older women. The occasion was a celebration connected with the Devil Bush, which was situated immediately behind the Government compound. During the night, the moon being full, strange sounds issued from the Devil Bush. Later, apparently, the Devil and his pupils came forth into the town, where a great crowd had gathered and drums and shouring made a merry din. From time to time could be heard the unnatural, squeaky voice assumed by the Devil, and at intervals loud explosions occurred. On the next day the remaining 24 miles to Gbanga were covered, making a total of 80 miles by conservative estimate in four days.

Gbanga to Tappi

On leaving Gbanga the Expedition was divided into two sections in order that more territory might be covered, and I accompanied Strong's section with Whitman and Coolidge. We had with us then only seventy loads, superfluities having been sent back to Monrovia. Among them went the tents which were no longer needed. It was arranged that the party with Bequaert should collect among the hills to the northward, and then to return along the St. Paul's River to Monrovia.

There were said to be two or three ways of going from Gbanga to Tappi. The northern route is probably the best road but the longest, and there is a short cut which is said to be all but impassable during the rains. We chose the southern route through Zicker, or Zeeké. Leaving Gbanga on September 24 we travelled, over an "improved road," to G'bi, or Gibi, where there was a Government Station under a man named Ashford. He is a good sort. Thenceforth we generally followed trails which led through the welcome shade of high forest. Several towns were passed on the way to the St. John's River. The river is broad, smooth, and easily crossed by canoe at this point. After crossing the river in the afternoon we soon came to Que Congo Tar, or Quelli Gar Tar, in the country of the Mahs.

In the Kpwesi and in the Mah country the names of most of the villages end in *tar*, meaning town or village. *Quelli* means water or river. A few hours beyond Que Congo lies another river, perhaps 100 yards wide or about two-thirds of the width of the St. John's. Doubtless it is a branch of the St. John's, for it occupies the same valley. It was called locally the Yah. The

Photographs by L. Whitman

The town of Suah Koko

Suah Koko, a female Kpwesi Paramount Chief

Entrance to compound of a Kpwesi Chief

Screened entrance to a secret bush school, Weynu

current was swift and there were no canoes. Crossing was effected by means of a rope of vines extending from shore to shore and a raft, which was moved back and forth along the rope with the help of the current. This river probably corresponds to the Yapa of the Washington map.

Little was seen of the Mahs because we passed quickly through their country. They are wilder and less intelligent looking than the Kpwesi, but many of them are good specimens physically. They raise rice and have more bananas and plantains than do the other tribes. At Que Congo there were a few white sheep, the only ones we saw in Liberia. They invaded the palaver house during the night, seeming to feel that it belonged to them.

A fine new post is being built at Zicker, but the country round about is little inhabited, and several ruined towns were seen near there. The distance from Que Congo to Zicker was about 18 miles, and that from Zicker to Tappi not less, I think, than 24 miles. The distance from Gbanga to Tappi by the way we went was about 73 miles, and was covered in four days.

Tappi and the Gios

Tappi is in the country of the Gios. The Mahs appeared more primitive than the Kpwesis, but the Gios were lower still. The Leopard Society, which murders many people and feasts upon human flesh, is active about Tappi and at Blau. The villages of the Gios are slovenly and the huts are not kept in repair. Many individuals are so low that their faces show no sign of intelligence or any ray of human feeling. The Government, which has an important Post under a Deputy Commissioner at Tappi, has not yet succeeded in putting an end to the practices of the Leopards in spite of the application of vigorous measures. It is said that the people are afraid to testify, and perhaps the local chiefs are members of the Society. A number of confessed Leopard men were labouring at the Post in chains. They kept us supplied with firewood. Once I found a fresh human thigh-bone lying beside the trail.

The Washington map shows Sauro situated on the Nuon River at a point close to the border of French territory. By going to Sauro it would, therefore, be possible to check our position, and this was easily accomplished. Sauro proved, as had been calculated, to be only one day's march to the eastward from Tappi. Strong and I went to Sauro, while Coolidge and Whitman spent a few days hunting elephants. They got on the trail of a herd, but, through an error of judgment or by design of their guides, failed to come up with the elephants.

Our clinic at Tappi was poorly attended. The people seemed suspicious and unfriendly. A one-eyed Mandingo has an establishment there. Although I relieved him of distressing symptoms and he expressed great gratitude at the time, he refused to aid us later when porters were urgently needed. There was a small school at Tappi of about twenty boys whom we examined. The Deputy Commissioner had the best house we had thus far seen, but he was an ineffective individual. While we were there the Commissioner of the Third District and his retinue arrived from Saniquelli in great pomp. The Commissioner, his staff, and some women were borne in hammocks to the music of drums, and he himself was preceded by heralds dressed uniformly in strange robes and wearing curious head-dresses.

Rice pounding went on daily in front of our quarters at Tappi. A gang of

women was kept at it from sunrise to sunset under the direction of an elderly woman, who continually shouted, "Kaióga, kaióga, kaióga" (work, work, work), while Government "messengers" attired in blue cotton uniforms with red trimmings stood by with whips, which they used occasionally on the women. The work was performed rhythmically to a monotonous refrain in which the words "buneo, bun" frequently recurred. We were told that the rice being pounded came from a Government farm in the vicinity, that it was destined for Monrovia, and that it was produced and transported by unpaid labour.

The Mah and the Gio women wear bangles of aluminium decorated with designs which are cut into the metal, and ornamental hairpins of the same substance. These trinkets are made probably from rods of the metal obtained by trade. Necklaces of leopards' teeth are fashionable, too, but the teeth are usually artificial and appear to be of European manufacture. A few healthy-looking cattle and two horses lived about the Post. One horse was in excellent condition, but the other was emaciated.

Tappi to the Cess River

Darkness overtook us in the forest and compelled a halt at Zai, which had been evacuated recently. Here the washman quickly located the house of the "Devil," abstracted his suit of split palm-leaves from under the rafters, and, putting it on, danced about with gusto. Probably the washman himself had been a "devil" once upon a time. On several occasions, at any rate, he thus appropriated the "devil's" paraphernalia, and at one long-abandoned village he discovered a black wooden mask.

The next morning we quickly reached Grahn, where there was only one old man and a few women. The Commissioner of the Third District had passed through two days before and had taken with him most of the men. The rest, we were told, "have go for Bush."

About two hours' travel brought us to the river Cess, smooth but swift at this point. The trail, now scarcely visible, turned down the right bank. At frequent intervals small streams had to be crossed, sometimes upon a rickety log, and sometimes by wading shoulder-deep or by means of a "monkey bridge" of poles so placed as to enable one to climb into a tree. Walking along its branches one passes on to those of a tree on the opposite bank, and so to the ground again. Being practically naked, the porters forded most of the streams.

About mid-afternoon we arrived at the crossing-place. Our guides, shouting across the river, were answered from the farther shore, but no one showed himself. After a time a man called across in English, and a long palaver ensued. The people thought that we had soldiers with us, and were afraid to come over. The river was at least 100 yards wide, the current swift, and the water too deep to ford.

The Cess River to the Coast

Trué is in a country which is called locally "G'bo." Probably its people are related to the Krus of the coast. Our "boys" called them "Bush Krus," and had no difficulty in communicating with them, whereas they had been able to talk little with the Mahs or with the Gios.

The huts of the Basas and Kpwesis are square, and those of the Mahs and of the Gios near Tappi are round. At Grahn and Weeha the huts were square again. All the huts thus far seen stood on the ground and had mud walls. The huts of the "Bush Krus" from Trué to Bashman are of an entirely different character. They have light frames, are raised several feet above the ground, walled with woven lattice, and have a narrow verandah or shelf along the front under the overhanging eaves. As there were no palaver houses to camp in, we would get the village chief to assign a house for our use. Ventilation was then secured by paying the owner to remove a wall.

At Chekoma we stopped for a day and held a clinic. Meanwhile the inhabitants, having heard that we intended going through the Basa Bush, took council of their fears. Again there was much delay in starting, but Sordya was reached at last. Unlike the huts at Chekoma, those at Sordya were walled with mud. It was a small village and most of the people were away. Fortunately, we met there a Negro trader from the coast. He knew the country and succeeded in getting for us a number of stalwarts from Crow Town, a couple of hours distant. With these men, a few people of Sordya, and some of those from Chekoma, we proceeded the next morning into the Basa Bush, a wide tract of country, nearly flat and heavily forested, crossed by many streams, and much of it swampy. There are no inhabitants, and three days of travel are required to pass through the Bush with loads. By this time we had reached a lower altitude. The atmosphere became like that of a greenhouse, heavy showers were frequent, and the forest steamed visibly after rain. For hours at a time we followed muddy trails which had been obliterated here and there by elephants. The porters shouted and chanted to lighten labour and to keep in touch with each other. I sometimes lagged behind to listen to the sounds of the forest and in the hope of shooting game. Several times it was only by the persisting turbidity of the water that I was able to follow the track of the porters through a swamp. Whenever the trail forked the branch not taken was blocked by the leading porters with a broken bough.

At 2.30 p.m. on the fourth day we stood upon the banks of the Sangwin river. The crossing was soon effected in canoes, and, arrived at Towya in the Kulu country, we felt that all serious difficulties had been passed. Three days were spent at Towya waiting for porters to bring on the loads that had been left in the "Bush." The interval was passed, as usual, in medical work and collecting.

The people at Towya were called Kulus or Bush Krus, and they spoke a dialect of Kru. From Towya to Sino took three days of travel, stopping for the night at Bashman (or Bestman) and at Paibo (or Paidibo).

At Bashman we saw a coconut palm and were told that the chief had a grove of them. Cocoa and breadfruit were also seen growing there, and I watched the preparation of palm oil. To macerate the oil-containing rind, the nuts were pounded in a large wooden mortar with the end of a heavy stick. From the resulting mass of skins and fibrous pulp the oily juice was then squeezed into a shallow trough. The liquid in the trough was beaten with a sort of swizzle stick which caused the oil to rise as froth to the surface. The frothy oil was then skimmed off and clarified, finally, by boiling.

Sino was reached two days later. It is a small port of decreasing importance,

but a few white traders remain. The town lies along the outer beach and has access to a lagoon like that at Monrovia. About a mile away along the beach is a large Kru settlement called Fish Town.

Sino has two long sandy streets in which grass grows. The wooden houses are dilapidated but shaded by mangoes and coconut palms, and here and there about them grows the purple Bougainvillea, the red Hibiscus, or a vine bearing beautiful yellow flowers. The town has an air of unbroken leisure and repose. We received a call from an elaborately dressed darky who informed us that he had once been a "free guest of the United States Government": he had served time at Sing Sing.

Because steamers stop rarely and irregularly at Sino, we engaged from a Dutch trading house a surf-boat with rowers and a sail. With the crew, the "boys," the baggage and a few uninvited guests, the boat was so full that one could hardly move. There was just room enough under the arched shelter of palm leaves in the stern for our party of four to sit. About noon a favourable breeze sprang up and swept us quickly along. We landed on the beach at Grand Basa in the morning to cook a meal and to rest, were carried aboard again at noon upon the shoulders of the crew, and sailed onward as before. There were heavy showers during the night, but while it was still dark Cape Mesurado was rounded and the anchor dropped off the bar. Soon after daylight on November 4 we landed at Monrovia.

Currency and Porters

The common unit of exchange in Monrovia is the British West Coast shilling, but the silver best known in Gbanga is the French coinage from the Ivory Coast. The Liberian copper coins are generally refused by the natives of the interior, who are not familiar with them. We carried several thousand dollars' worth of West Coast shillings and a considerable quantity of copper coins, but the latter proved to be of little use. By agreement with the Liberian Government before leaving Monrovia, the porters were paid a shilling a day, but when unusually long marches were made we gave them more. As a rule they fed themselves, but when they could not return home on the same day we would give each man a cup of rice. The standard cup for a day's ration is a salmon tin which holds rather less than a pint. A few sacks of rice were kept in reserve for this purpose.

Three bales of native tobacco, consisting of bunches of six or eight leaves tied together in heads, were carried along as an alternative form of currency. A head of tobacco has the purchasing power, theoretically, of a shilling. It is worth more in practice because tobacco is universally desired and used. The native porters showed little desire for money. Probably some of them had never had any before, and perhaps they believed that the chief would relieve them of the shilling, whereas tobacco could be enjoyed at once. Whenever possible, each man was paid at the end of his trip, but many of the chiefs and some of the officials insisted that we pay the money to them.

The honesty of the porters was quite remarkable. Although it would have been easy for them to pilfer food or tobacco from their loads they never did so; neither did we ever lose a box. When a porter deserted he invariably left his load in the middle of the trail. At first we watched our sealed boxes of

Gio huts, Liberia

Towya, a Bush Kru village

Photo by G. C. Shattuck

A village, 6000 feet above sea-level, two days' journey north of Luofu, Eastern Congo

cash while on the march, but later gave it up. Loose cash was carried in locked trunks. Occasional thefts of small articles were attributed to the "boys." The carriers in Liberia are not professional porters. Many have poor physique and are not fit to carry more than 40 lbs. on a long march. A few 50-lb. loads caused much trouble by lagging, and they sometimes required two men.

Drums and Music

Familiar as we are in America with darky melodies and with jazz of negro origin, I was surprised to find nothing of the sort among the native tribes. They have simple chants which the men raise on the march, or when at work in gangs. The women sing, too, when pounding rice in a group. In either case the words are improvised by the leader and relate to persons seen or to the work in hand. When there is singing the work goes well. Therefore drums are often used to encourage the labourers on the roads. The drum is loved by the native. After the day's march he retires to the village to drum and to dance for hours. When the moon is full these festivities may last all night. Every available drum is beaten at once, but always in perfect time. The energy of the performers occasionally approaches frenzy. They are stimulated, doubtless, by the free use of palm wine, but the grosser forms of drunkenness are seldom seen.

The Mandingoes at Gbanga had a kind of drum which I did not see elsewhere. It consisted of a basin partly filled with water in which floated a large calabash, bottom up. The orchestra for the dance consisted of two such drums, which were beaten with padded sticks held by the performer in either hand. The signal drums were made of large sections of a tree-trunk which had been hollowed out through a slit in the side. They were struck across the slit with a stick or with two sticks alternately.

We saw the hunters at a Kpwesi village being assembled by means of a rapid tattoo upon a drum of this kind. Other drums, both large and small, were headed with raw hide. These drums were beaten with the hand or with a stick. Sometimes the porters were called by a series of blasts on a trumpet of horn or ivory.

The only other common instrument was a rattle made from a small calabash suspended between strings to which large beads were attached in such a way that they could be made to strike the gourd by alternately slackening the strings and pulling them taut. The orchestra of the Kpwesi chief at Gbanga consisted of such a rattle and two small drums.

The bow and arrow are commonly used for hunting, but game is also taken by driving it into nets or by means of snares and traps. We saw several heavy deadfalls set for leopards. A few muzzle-loading cap guns are owned by the natives, but they are seldom able to obtain powder and shot for them. Such guns marked "Springfield, Model 1860" were on sale in Monrovia.

Tribal Customs

The Devil Bush of the boys and the Gri-gri Bush of the girls are the schools at which tribal lore is taught. The secrets of these schools are closely guarded so that accurate information about them is extremely difficult to obtain. All the Liberian tribes have something of the sort, but the periods of instruction

A village, 6000 feet above sea-level, two days' journey north of Lusofu, Eastern Congo. Photo by G. C. Shattuck

in different tribes vary from a few months to several years. Some account of these schools has been given by Sir Harry Johnston, by Lady Dorothy Mills,* and by Vandercook.†

Many persons have written about the Leopard Society, but there are less frequent references to the Alligator Society, which used to upset canoes and drown their occupants on the lower reaches of the Cess or of the Sangwin River. An object of both societies is cannibalism. We were told that the Liberian Government has succeeded in putting an end to the activities of the Alligators, but that the Leopards had not yet been eradicated.

Of religious practices I saw nothing. Several intelligent persons said, however, that some of the tribes believe that the spirit of a living man may enter into an elephant, and that should such an animal be killed when inhabited by a human spirit the man would die. It is said that elephants are almost impossible for the white man to kill in Liberia, and some persons suspect that natives always go ahead of the hunters and drive the elephants off. One white man, who had hunted them repeatedly without success, finally joined the Elephant Society, but has not hunted there since. An intelligent and successful Negro hunter from the Coast told me that he was accustomed to warn the chiefs that he would shoot any elephant he could and that they must "tell their men to come out of the elephants." With some tribes this kind of superstition is said to relate to the chimpanzee, called locally a baboon.

An official at Zicker said that the local natives believed that a lion lived on a hill in the neighbourhood. At long intervals when he was heard to roar the death of a native chief soon followed. Real lions are not known to inhabit the Liberian forest.

Individual Types

Except among the Mandingoes I did not observe physical traits characteristic of the tribe. On the other hand, most of the tribes show such a variety of types as to suggest extensive racial admixture. Many of the Mandingoes stand 6 feet or more in height. Their features and manners are unmistakably reminiscent of the Arab, and Muhammadanism has set its stamp upon them. The Vais, also Muhammadans, approach the Mandingoes physically and culturally. Men of the other tribes are of medium or low stature.

In all of the tribes there are men and women whose features are not negroid even though their skins may be dark or black and their hair kinky. Such individuals at once call to mind types seen among the white race, but the interior tribes have had so little contact with whites that it is difficult to believe that admixture of white blood is the true explanation. One of the blackest of our porters, a tall, raw-boned, powerfully built man, looked and behaved like an Irish labourer even to his stumpy pipe.

Temperamental types also reminded me again and again of those found commonly among other races. There was the roystering and assertive vulgarian, the man-about-town, the dandy striving for effect, the reliable or the shiftless foreman, and the lying knave.

The bearing of the Gio women is generally modest. The wife of a Gio chief

*'Through Liberia.'

†Vandercook, John W., "The Devil-Bush of the Golas," *Asia*. January 1927, p. 33.

may be dignified, and the woman who owns a small village may greet strangers with charming courtesy. Among the Kpwesis the eldest son of a certain chief has frank and easy manners in which there is no trace of servility or assertiveness. An unschooled Kpwesi, whom we hired as a porter, took great interest in my clinic and voluntarily helped me day after day. He was gentle with the patients, and when he looked at them his facial expression was most kindly. With a little training he would have made a good hospital orderly.

An interesting man met in the interior was Mr. S. O. Gogemoh, a Black from Nigeria. He had been educated at a college in North Carolina, where he specialized in dairy farming and poultry raising. Subsequently he visited Haiti, Cuba, and the Bahamas to study tropical agriculture. For the five years past he had been conducting agricultural experiments near Zeanschue. He had introduced a number of plants new to Liberia, and could demonstrate the deleterious effect of burning the land before planting.

Huts

The Kpwesi huts are all walled with mud and thatched with leaves. They may be round, square, or oblong, and are often whitewashed with clay. The walls of a few are decorated with rude outline drawings of men, animals, or boats. These huts may be large or small, but the pitch of the roof is always moderate. There is a good deal of symmetry in the arrangement of the village, and an open space is left in the centre. The Basa villages are similar.

The Mahs and Gios likewise use mud walls, but their huts are nearly always small, circular in shape, and have very high pointed roofs. Their villages show little evidence of planning. The tribes living near the Sangwin build huts of various types which show conflicting influences, but the Bush Krus near the Cess elevate their houses above the ground, use neatly woven matting walls, and a peculiar shape of roof suggesting the Chinese pagoda.

In the open country of the Eastern Congo the huts are shaped like inverted bowls and are thatched all over with grass. Huts of similar shape thatched with leaves are seen in the Ituri forest, but much larger and better huts of various kinds are found there as well.

The huts of the Pigmy village were very small, as will be seen by comparing them with the native in the illustration. They were supported upon light wicker frames and covered roughly with large leaves. The moment that I saw these huts memory flashed back for more than thirty years to du Chaillu's drawing of a similar Pigmy village in Ashango.*

The Future of Liberia

Unless rich deposits of metal or of oil should be discovered, which seems unlikely, the wealth needed to improve conditions and to raise standards of living must come mainly from the soil. If rubber growing develops upon the scale proposed by the Firestone interests it is likely to absorb most of the available labour, the actual amount of which is still uncertain. Should sufficient labour be found, fruit growing, coffee planting, and cocoa raising might become important industries. Oil and coconut palms, bananas, citrus fruits, pineapples, cotton, sugar-cane, tobacco, sweet potatoes, manioc, and various other fruits and vegetables are grown for local consumption.

*Paul du Chaillu, 'A Journey to Ashango.' 1867.

Dry rice of excellent quality is a staple food of the native, but rice is actually imported to feed Monrovia. The prevailing ignorance is demonstrated by the neglect of existing coffee plantations, by the crudely prepared cocoa, and by the poor state of nutrition of a large proportion of the indigenous population. The climate, with its abundant rainfall and absence of prolonged drought, is remarkably favourable for agriculture, but other parts of West Africa and the Belgian Congo are far ahead of Liberia.

The native tribesman needs tools, instruction in agriculture, and opportunity to earn money. He must have greater security of tenure and must be freed from certain oppressive practices before he can be expected to improve his condition much. Roads, bridges, medical attention, and hygiene are outstanding desiderata.

The Eastern Province of the Belgian Congo

The Eastern Province is exciting special interest now because of its undeveloped mineral wealth and opportunities for raising coffee.

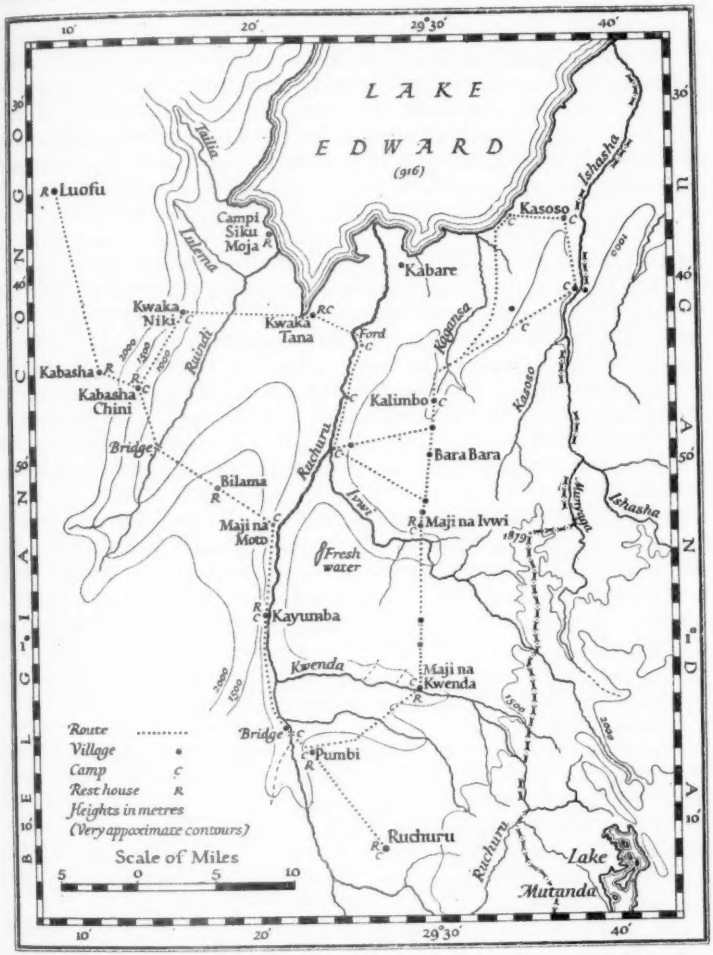
Ruchuru was an important administrative centre until quite recently, when the District Commissioner, the Government Offices, and the Bank were all moved to Bukavu on lake Kivu, in a beautiful situation, and a relatively good climate. It is destined to increasing importance because large interests are preparing to raise coffee in this region. There were two ways to Bukavu, a trail from Usumbura and a motor road from Uvira. Uvira itself was otherwise of little importance, and motor transport from it was possible for only about 20 miles, where a small river had to be crossed by canoe. Bukavu was reached by two days' journey on foot from this river. A night was spent at Nya Gezi, where we were hospitably received and well fed at the Mission of the White Fathers. There were several shops at Bukavu carrying a variety of tinned provisions.

A small steamer towing barges traversed the lake in two days to Kisenyi at the foot of the volcanoes. No place that we saw in Africa compares with it for charm. Our tents were pitched in a grove of trees beside a beach of clean white sand, and the clear water was delightful for bathing. There are no crocodiles in the lake.

From Kisenyi to Ruchuru took three days of travel over a good road. The first night was spent at Kibati, where good water could only be obtained by transporting it from the lake. There is water, however, on Ninagongo above the usual camping-place near the top, and elephants had been there for it. A stop was made at Kibati to climb Ninagongo, and a night was spent at Lulenga with the White Fathers, whose kindness is remembered by all who have passed that way.

At Ruchuru we met two shooting safaris and several visitors seeking concessions of land for coffee growing. The unprecedented demand for porters added to the difficulties of the hard-working and obliging but overburdened Administrator, M. Du Buisson. The glory of Ruchuru has waned since the departure of the Commissaire and of the Bank, and a number of good houses with pretty gardens are going to ruin. A high chief, locally called "the King," lives there. Fowls, eggs, and a small kind of tomato could be had in any quantity. The local shops carried sweet chocolate, cocoa, and canned lobster, and they could supply in quantity salt, beans, and white potatoes.

A shooting safari needs much salt, and should take with it plenty of beans as "posho" (food) for the porters. Locally grown sweet potatoes were scarce on the plains of Lake Edward, and beans are far more economical to carry. Bananas are the worst form of posho. Men cannot travel far without other



The plains south of Lake Edward, from official surveys with details by Dr. Shattuck

food. Neither should they be given meat only for any length of time unless they can exchange some of it for native meal. Three important roads enter Ruchuru, namely that from Lake Kivu, that going north over the hills west of Lake Edward to Beni and on to Irumu, and that to Bakoba on Lake Victoria

by way of Kabale. It was said that this road was passable for motors from Bukoba to Kabale, and that efforts were being made to open it for motor transport to Ruchuru. Owing to the sleeping sickness about Lake Edward, transport on the lake has been given up and permits are required for entrance to some of the best shooting-grounds.

The Ruchuru plains are relatively small, and are becoming too well known to hold game much longer outside the Reserve. Lions were no longer numerous there, but Strong encountered two when out with his gun-boy on a rainy morning, and shot one of them. Both of us got very fine buffalo heads. If a stop is made at Pumbi, to which water should be carried from Ruchuru, it takes five days to go from Ruchuru to Luofu. Water should also be carried from the river from the hot springs called Maji-na-Moto to Bilama.

To Lubero and Beni

On April 25 we climbed the scarp and camped at Luofu on the way north. Here the Ruchuru porters had to return. They are not allowed to go farther because of the relatively cold climate of the hills to which they are not accustomed. For the next stage of four days men had to be sent from Lubero, a fine Post picturesquely situated in a broad valley. The older post at Luofu had been abandoned in its favour. The reputation for energy and efficiency of the Administrateur of Lubero, Lieutenant Absil, is borne out by the appearance of Lubero. He travels much to supervise things personally, and we met him on the road. By his orders strawberries have been planted at the rest-houses in his area.

The trail from Luofu to Lubero was being made into a road, and parts of it were already in good condition. On the other hand, there were some high ridges to be climbed, and the trail descended into gorges where it was so steep and slippery as to be difficult for the porters. This part of the country was sparsely inhabited by wild-looking natives dressed in goatskins. The villages were near the tops of the hills where there was much rain and mist, and where the nights were so cold that I slept in two blankets and wore my clothes as well. The lower hills were grassy and the higher were forested.

It was said that the Kilo Mines (near Irumu) have large concessions in these hills, and that the road will be improved all the way from Irumu to Ruchuru. Much work has been done already between Lubero and Beni, but much remains to be done, and many small bridges will be required before the road can be used for motors. The askaris (native soldiers) under the orders of the engineers who were building the road were being sent out to shoot whatever they could to feed the labourers. There was little sign of game within a day's journey of a road-gang.

Five days of walking, most of the way through open country, took us to Beni, which has been rebuilt near the native village of Bungulu, to replace the old town of Beni, which was in the Semliki Valley. Having been evacuated some years ago because of a very severe epidemic of sleeping sickness the Valley is now closed. Beni stands now on the watershed between the Semliki and the Ituri, a branch of the Congo. From the open grassland about Beni one looks westward over the Ituri Forest, a beautiful panorama toward sunset, and sometimes in the late afternoon when the clouds dissolve, the snow-

capped peaks of Ruwenzori may be seen towering against the eastern sky beyond the valley of the Semliki. On the north the forest comes quite close to the town. After medical work at Beni, elephant shooting with the pigmy Wambuti in the forest, and a visit to the ruins of Old Beni, the safari took the road to Irumu.

Beni to Irumu

The road, which leads through magnificent forest, was in good condition most of the way, but the Loya river was unbridged and had to be crossed by canoe. The journey from Beni to Ingaresa's Village on the Loya took five days. From there it is only about 25 miles by automobile over a good road to Irumu, which could be reached by motor car from the Bahr-el-Jebel, or Albert Nile, from Mahagi Port, or from Kasenyi on Lake Albert, or by a road quite recently opened from Stanleyville.

Communication between Lake Victoria and Lake Albert had been greatly improved by the opening of a good road from Kampala to Butiaba, and there was another road to Fort Portal. Belgian officials were going into the country south of Irumu from Kampala via Fort Portal, and a motor road was projected from Fort Portal across the Semliki Valley. This would render Beni more accessible and would shorten the time to Irumu.

To avoid relapsing or tick fever we used tents and never slept in the rest-houses from Uvira to Irumu. The disease is carried by a species of tick of the genus *Ornithodorus*. Locally, both the tick and the disease are commonly called "kimputu." The disease is most prevalent in the lower country near Uvira and about Lake Edward at altitudes of about 3000 feet. Formerly it was not found much above this level, but the ticks are said to be spreading along the routes of travel into higher country. Boys from uninfected areas are almost sure to contract the disease unless they sleep in tents.

Appendix I. Sources of Information on Liberia

A Negro named Anderson is said by Moret (1) to have "traversed the entire country" in 1866. According to the same author, Bohlen penetrated to the source of the Sino River in 1869, and Hostains and d'Ollone traced the course of the Cavalla River in 1898. In 1909 Naber and Moret, members of a French expedition, worked along the south-eastern frontier between Liberia and the Ivory Coast. Naber was taken sick at Xinta and was carried across Liberia to Monrovia. His route is not known. Moret himself left the boundary at Gribo (where the Cavalla makes a sharp bend) and made his way to Sino on the coast. I have been unable however, either by reference to maps or from our own observations, to identify any of the places visited by Moret in the interior of Liberia. The fact is not surprising for most of the native towns in Liberia are named after the reigning chief. Moreover, old towns are often abandoned and new ones built in other places.

A few years ago Marion R. Cheek and Johnson of the Firestone Company went from Monrovia by way of Kaka to Tappi and came out at Sino. They gave us useful information about the country in general, but only vague data as to their route. In 1926 Lady Dorothy Mills (2) made a similar but longer trip, continuing to Saniquelli and coming out by way of the Cavalla River. H.E. Mr. Dresselhuys, for some years Liberian Minister in London, has hunted in the interior.

Being unable to obtain accurate geographical information about that part of

Liberia which lies south of the St. Paul's River, we made compass traverses, checked up at two points near the boundary, as the only means of ascertaining our position when in this region. Even the information picked up along the route was nearly always conflicting and inaccurate about the way to any place more than a day's journey distant. The country north of the St. Paul's is better known, and the maps of it are correspondingly better.

Büttikofer (3) made valuable zoological collections in Liberia between 1879 and 1882, and again from 1886 to 1887, and published a series of books and papers on the subject. He ascended the St. Paul's River for about 30 miles to Geweh.

According to Alldridge (4), Wallis in 1898 visited Pandeme, then a notorious town of slavers and robbers in Northern Liberia. Hübner (5) traversed part of the country in a north-north-easterly direction from Cape Mount in 1903; Voltz (6) explored the north-central portion in 1906; Wallis (7) looped through the northern part in 1908; and Sir Alfred Sharpe (8) in 1919 crossed the northern border from Sierra Leone and came down along the St. Paul's River to Monrovia. According to Reeve (9) he visited the country again in 1920. Sir Alfred very kindly showed his notebooks to Strong and me while we were in London.

A deal of information about the people, plants, and animals of Liberia was compiled by Sir Harry Johnston (10).

(1) Moret, *La Géogr.* (Paris), 21, 1910, 21–6.
(2) Mills, Lady Dorothy, 'Through Liberia.' London, 1926.
(3) Büttikofer, J., 'Reisebilder aus Liberia.' Leyden, 1890.
(4) Alldridge, T. J., 'The Sherbro and its Hinterland.' London, 1901.
(5) Hübner, Albert, *Petermanns Geographische Mitt.*, 49, 1903, 174.
(6) Voltz, W., *Jahresb. Geogr. Ges. Bern*, 22, 1908–10, 113.
(7) Wallis, Capt. C. Braithwaite, *Geogr. Journ.*, 35, 1910, 285.
(8) Sharpe, Sir Alfred, *Geogr. Journ.*, 55, 1920, 289–305.
(9) Reeve, H. F., 'The Black Republic.' London, 1923.
(10) Johnston, Sir Harry, 'Liberia.' London, 1906.

Appendix II. Maps of Liberia and the Congo

The Firestone engineers provided us with their map. Into it had been incorporated their own surveys and such other information as they believed to be reasonably accurate. The sketch-map (p. 218) was adapted from that of the Firestone Company, which in turn was outlined from the British Admiralty charts of the coast and from the work of various boundary commissions. The best published map of Liberia was that prepared in 1916 in Washington, D.C., by the War College Division of the General Staff. Some, at least, of the towns and roads shown in this map no longer exist, and the courses of several rivers are grossly inaccurate. The dotted courses of important rivers on the sketch-map indicate that the real courses are still unknown. The position and height of mountains shown on other maps are so uncertain that they have not been included. My map shows only such hills as I saw.

The route traversed by our Expedition from Monrovia to Gbanga, from Gbanga to Garmu, and from Gbanga to Sino is based mainly upon a rough compass traverse by Whitman. It was modified in some details by similar observations of my own. The northern loop back to Monrovia was indicated by Bequaert, who was in charge of the section of the party which took this route. The altitudes were estimated by Coolidge using an aneroid barometer. Unfortunately, many of his observations of altitude were accidentally destroyed. To put in the names of all the towns and half-towns passed through upon our route would overcrowd the map. Many of them have therefore been omitted.

The Map of the plains south of Lake Edward (p. 233) was based upon three

published maps. Details were added to it from my own observation, but no claim of accuracy is made for such data.

Appendix III. Topographical Observations

Along the Dukwia River the land is low, but there are small hills a little back from the river. The country rises unevenly but gradually on the way to Lango, and the glimpse we had of the Farmington river near Lango revealed a series of rapids and small cascades with swiftly running water between. The river was perhaps 100 yards wide at this point and too strong and deep to ford. There is said to be a place somewhere near there where crossings are made by canoe. Two small but strong rivers, doubtless branches of the Farmington, were crossed on rather rickety bridges shortly before reaching Memeh.

Between Kaka and Gbanga the land at first is undulating and, later, corrugated, low ridges alternating with swamps, most of which have to be waded. A higher ridge, elevated perhaps 1200 feet, separates Reppue from Miamu, and high ridges are traversed on the way from Gbanga to Garmu. Coolidge called my attention to the fact that about 10 miles from Kaka on the road to Memeh a solitary hill was seen rising some 500 feet above the surrounding country toward the south-east. It was called the Gibbi, and was said to be in the Gibbi district across (*i.e.* south of) the St. John's River. Near Garmu are several rounded hills. Estimating the elevation of Garimu at about 1000 feet, I believe the ridges mentioned to be about 1300 feet and the hills about 1500 feet above sea-level. Most of the country between Kaka and Gbanga has been cleared, and is covered with scrub. Elsewhere there is high forest, except that the hills near Garmu bear a lower growth.

From Gbanga to Gbai the country is nearly flat and of uniform elevation. Beyond Gbai the trail descends into the broad valley of the St. John's, where high forest is extensive. The trail rises moderately again after passing the Yah, but no high ridges were crossed between there and Tappi or between Tappi and the Cess river.

No large river corresponding to the Yah of the Washington map was crossed or seen between the Yah and Tappi. On the way to Sauro from Tappi several high ridges were traversed and higher hills were seen. Between two of the ridges a swift stream about 20 feet wide was crossed on a bridge. Its course seemed to be south-easterly. A tumultuous river 20 to 30 yards wide was seen on the north of the trail near Sauro. It flowed east, and it is probably an important branch of the Nuon.

Most maps of Liberia show the "Satro Mountains" between the upper waters of the Cess and those of the Sangwin. Moret (*loc. cit.*), however, who probably passed through this country on his trip from Gribo to Sino, does not mention any mountains there or elsewhere along his route. We crossed a single fairly high ridge between Trué and Chekoma, but saw nothing from it much higher. This ridge may be a spur of the Satro Mountains, but I am inclined to suspect that they are no more than hills and to wonder whether they are as large as the hills seen from the trail between Tappi and Sauro. These I thought might be 2000 feet in height.

Sauro probably corresponds to Taulo on the Washington map. Taulo should be correctly placed because it is close to the border. According to our calculations, if this be true, Tappi has been placed too far north on the Washington map.

From Gbanga there are roads to Kaka, Bakra, Garmu, and Saniquelli, and there are two or three routes to Tappi as well. Several important roads come together at Tappi. One of these goes to Saniquelli, one to Grand Basa, one

passes through Grahn Tar and north of the Cess to the coast at River Cess, and there are routes to Gbanga, to Sauro, and to other places.

The Basa Bush is elevated perhaps 400 to 500 feet, and is crossed by many streams. The land is nearly flat, so that large portions were flooded to the depth of 6 inches to 1 foot in late October. At that time showers were frequent and heavy. The absence of villages in the Basa Bush is due, probably, to the wetness of the place, but elephant signs were numerous. After leaving the Sangwin River the trail passes through a country of low ridges to Paibo, after which the coastal plain is soon reached.

DISCUSSION

Before the paper the PRESIDENT (Col. Sir CHARLES CLOSE) said: Dr. Shattuck, who is to address us to-night, was a member of Dr. Hamilton Rice's Expedition in the Rio Branco and the Rio Parima. Many of those present this evening will have a lively recollection of the account which Dr. Hamilton Rice gave us of that very remarkable expedition. I am sorry he is not present to-night. He hoped to be present, but was unable to get over from Paris in time. Dr. Shattuck after a year of rest—or shall I say of civilization?—determined to make a change in his study of tropical life, and this time he went to Africa, having been sent by Harvard University on a medical mission to study the medical questions in tropical Africa. They chose particularly Northern Liberia and the Eastern Congo, and Dr. Shattuck had the opportunity, of which he took full advantage, of studying the geographical conditions in those countries. In particular, he studied what we may call the small life, those miserable little microbes which afflict humanity, the smallest population in Africa so far as size is concerned, but certainly not small in number. We shall hear to-night the geographical conditions which he is fully qualified to describe, and, in particular, those medical conditions on which the future of Africa does really depend. We may say that the future of Africa depends on the doctors, and it is as a doctor particularly, but also as a traveller and explorer, that we welcome Dr. Shattuck.

Dr. Shattuck then read the paper printed above, and a discussion followed.

The PRESIDENT: As the time is short we will limit the discussion to Liberia, and I will first call upon Mr. Coolidge to speak.

Mr. HAROLD JEFFERSON COOLIDGE, Jr.: There are two or three small points that might be of general interest. First, in the course of our trip I noticed the effect of light in Liberia and in the Congo on photography. In Liberia all the photographs that I took had to be exposed practically twice as long as one would expose photographs taken in a higher part of the Congo. I also noticed the effect of the rays of the sun on white people. When we got out to Monrovia we were told that pith helmets would be the only thing to keep the sun-rays off, but with a little experimenting we found cork helmets were satisfactory. It was always important to wear the helmet during the middle hours of the day even if the sun was hidden by clouds. I believe in parts of East Africa and part of the Belgian Congo it is unnecessary to wear a helmet all day; in fact, I have seen several people who go through the day in a felt hat and do not seem to be the worse for it. This seems particularly true of Kenya.

Then another point of a different nature is the question of the system of handling specimens and doing scientific work. Our expedition when in base camps, particularly in Liberia, handled the scientific and medical work on a sort of joint basis. In fact, it was superficially rather like a Chicago meat-packing plant in which case a pig put in at one end comes out as sausages and bristle-brushes at the other. Immediately an animal was brought into camp Dr. Bequaert would rush up to see if it had ticks or fleas, and Dr. Theiler to make

fresh blood tests and see if the animal had parasites; the zoologist would measure and skin it, and the best pieces of meat we would keep for ourselves. If the animal was diseased pathological speciments were preserved. Then the skull and bones were cleaned and kept to be sent to the museum. In fact, very little of the animal was not used one way and another. We also had on the expedition a botanist, Dr. Linder, who was also a mycologist. A great many of the skin diseases are fungus diseases, and his knowledge of fungi was valuable in helping on the medical work, particularly in connection with fungus diseases. In fact, anything going was of interest to the expedition except minerals and butterflies. It was discovered that spiders were being neglected, so a private spider collection was started on a competitive basis.

If one should return to Liberia twenty years hence, one might find a few black rags used to cover the sores of successive generations. These would be remnants of snow-white bandages put on by Dr. George Shattuck in some of his clinics. He and Dr. Strong were like good Samaritans, giving medical service to all the sick we came in contact with.

Then Liberia is interesting from a zoological point of view, because there are found there interesting pygmy animals not found in many other parts of Africa. The pygmy hippopotamus is, as far as I know, not found in any other part of the world. We saw tracks of them, and one was caught not far from Monrovia while we were in the interior. We did not actually collect any, but I am sure there are a number there, particularly in the northern part of Liberia. We found a very rare small antelope called the royal antelope and described in Sir Harry Johnston's book. It stands only 10 inches high when full grown. I kept a young one alive for two weeks, feeding him through an eye-dropper. Thirdly, there is the pygmy elephant. Now, it is not yet at all certain whether it exists in Liberia, but from all the information I could obtain there from two or three native hunters, who at best are always unreliable, I would say that the pygmy elephant probably does exist. For two days I followed a herd of ten elephants, and the footprint of every one was 10 inches in diameter or smaller. Judging also by the heights of the branches broken by them I should say they were probably pygmies. I saw many skulls in the villages, a number of which were quite small, and I saw almost none that had the dentition of adult elephants. As to whether the pygmy elephant exists in Liberia or not is a problem for some zoologist to solve. The most authentic account of the animal is by Bell in his delightful book 'The Wanderings of an Elephant Hunter.' He condemned Liberia from the ivory hunter's point of view because the elephants stood 6 or 7 feet high even though they travelled in large herds. They had only "small small" ivory.

I have just heard within the last few days that a warranted pygmy elephant in one of the American Zoos has suddenly started to grow. The Germans have a fine specimen in the Berlin Zoo that, I believe, has not adult dentition, but that has not grown for several years.

Sir ALFRED SHARPE: I can only say that I was intensely interested in the paper which has been read because I have been in Liberia and also in the Eastern Congo. I believe that Liberia is one of the coming countries. It is the richest agricultural (and possibly mineral) country in West Africa. Cheap transport is the key to future development.

As to the pygmy elephant, I am quite sure that the last speaker was correct in what he said. There is a pygmy elephant, and quite a small one, in Liberia. I have seen, when up country, the tracks of quite a large herd. No foot was bigger than that of an elephant calf. If they had been only calves there would have been large footmarks as well as the small ones. I think it is up to some

explorer or hunter keen on natural history to find that pygmy elephant. As to the high mountains supposed to exist in Liberia, my own view is that they do not exist. In the far northern hinterland the average of the highest country is about 2000 feet; I do not think there is a mountain anything like 6000 feet in Liberia. I should like to express my thanks to the lecturer for the interesting paper he has read and also for the beautiful photographs he has shown.

Dr. SHATTUCK: I should like to add a word about the fine specimen of a gorilla which was collected by Mr. Coolidge. He made a special trip into the mountains above Katana (on Lake Kivu) to obtain it. No gorilla, we believe, had previously been obtained from this region, and Mr. Coolidge's description of the animal will be published later. The Belgian Government had kindly given permission to our Expedition to obtain a specimen gorilla outside the reserve for the Museum of Comparative Zoology at Harvard. I want also to take advantage of this opportunity to express thanks and appreciation to the authorities of the Belgian Government and of the Liberian Government for the courtesies and privileges extended by them to our Expedition. The Firestone Plantations Company was extremely helpful in Liberia. In the Belgian Congo, Gillespie & Co., of New York, and Lever Bros. of London and Brussels, extended most welcome courtesies and assistance. Helpful information about Liberia was furnished us in London by His Excellency the Liberian Minister, Mr. Dresselhuys, and by Sir Alfred Sharpe, to both of whom grateful acknowledgments are offered.

The PRESIDENT: Of all the many missions and expeditions that go to Africa there is none more valuable than medical missions, and of these there are few that have done more excellent work than that to which Dr. Shattuck was attached. We are very grateful to him for the account of his work. I was glad to hear reference to the book by that well-known Fellow of the Society, whom we have lately lost, Sir Harry Johnston. Dr. Shattuck has told me that it was the most valuable book he read on Liberia when preparing for the expedition. I suppose we were all impressed by the careful understatement by Dr. Shattuck of his own difficulties, and the difficulties of others. As an example, let me remind you of the photograph which he showed us of the chief with his twelve wives. Actually, so His Excellency the Liberian Minister informs me, that chief has 150 wives. We thank Dr. Shattuck for his lecture and congratulate him on the excellent work that he and his assistants have managed to accomplish.

A NEW EQUAL-AREA PROJECTION FOR WORLD MAPS. *A paper read at the Afternoon Meeting of the Society on 10 December 1928, by the Secretary for the author*

S. WHITTEMORE BOGGS

WITH man's growing desire to "see the world whole," the use of maps of the entire globe is increasing. The properties most to be desired in world maps, especially in so-called " distribution " and statistical maps, are the representation of the shape of large areas as accurately as possible, and areas in their true proportions.

For mapping climatic and other data on a world scale it is desirable that the parallels of latitude appear as parallel straight lines. Such projections also lend themselves to "interrupted" construction in gores or lobes of arbitrary width, in the manner introduced by Dr. J. P. Goode, of the University of Chicago.

Since a flat map can not be made to represent the shape of large portions of the Earth's surface perfectly, no name has heretofore been given to the property of good representation. The term "eumorphism" might, however, be appropriately applied to connote good shape of large areas, just as "orthomorphism" is used to signify true shape in small areas. Eumorphism (*i.e.* approximate orthomorphism in large areas) would be characterized by approximation to rectilinear intersection of parallels and meridians, and by the approximation to equality of linear scales along the parallels and meridians —or along all parallels and on at least a central meridian.

The projection herein described is an equal-area projection which is an arithmetical mean between the sinusoidal equal-area projection of Sanson and the elliptical equal-area or homolographic projection of Mollweide.

In computing the meridian of 90° from the centre of construction, values of y are initially computed as the arithmetical mean between the values of y, for any latitude, in the Sanson and Mollweide projections. A formula is then derived for x such that the projection will be strictly equal-area, and the area of the curve exactly the same as in the Sanson and Mollweide projections, viz. 4π for the entire surface of a sphere of unit radius. The expressions thus determined are :

$$x=\frac{2\sqrt{2\pi}\cos\theta\cos\phi}{2\sqrt{2}\cos\theta+\pi\cos\phi},\quad y=\tfrac{1}{2}(\phi+\sqrt{2}\sin\theta)$$

ϕ being the latitude, and θ the auxiliary angle used in the computation of the Mollweide projection. The intersection on the x axis=1·488398, and on the y axis=1·492505.

In order to equalize them the two formulae are multiplied by reciprocal constants, 1·001379 and 0·9986229.

The following coordinates of the 90th meridian are computed for a sphere of unit radius :

Latitude	0°	x 1·490450 y 0·000000	*Latitude*	50°	x 1·041960 y 0·895537
,,	10°	x 1·472335 y 0·183753	,,	60°	x 0·846496 y 1·061226
,,	20°	x 1·418091 y 0·366372	,,	70°	x 0·615121 y 1·218648
,,	30°	x 1·328006 y 0·546698	,,	80°	x 0·343191 y 1·364746
,,	40°	x 1·202494 y 0·723524	,,	90°	x 0·000000 y 1·490450

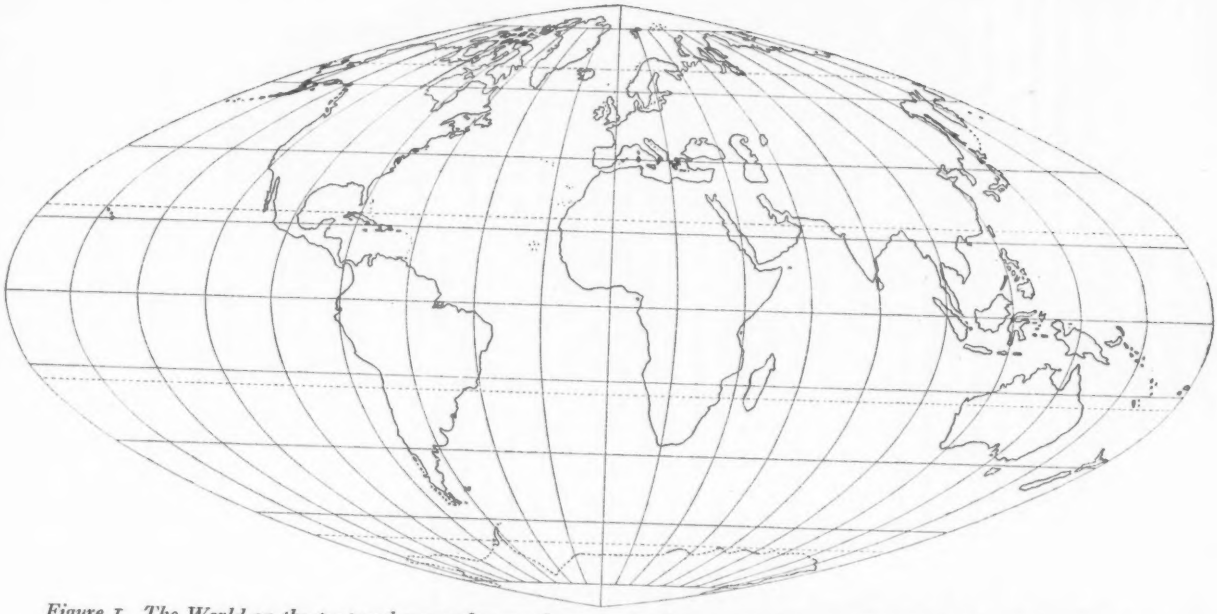


Figure 1. The World on the proposed eumorphic equal-area projection, a mean between those of Sanson and Mollweide

Whereas inequality in linear scales near the equator is conspicuous and highly objectionable in the Mollweide projection, it is hardly noticeable in the new projection ; and the same may be said of a zone of latitude between, say, 60° and approximately 75°, beyond which accuracy of linear scales is of slight importance.

Angular distortion in any equal-area projection with converging meridians must be great. But in the new projection it is considerably less than in the Sanson projection in latitudes below 62°, and it must exceed that of the Mollweide projection if it is to avoid excessive linear-scale inaccuracy. Above approximately 68° latitude the angular distortion in the new projection is less than that of the Mollweide projection, which is objectionably flattened at the poles.

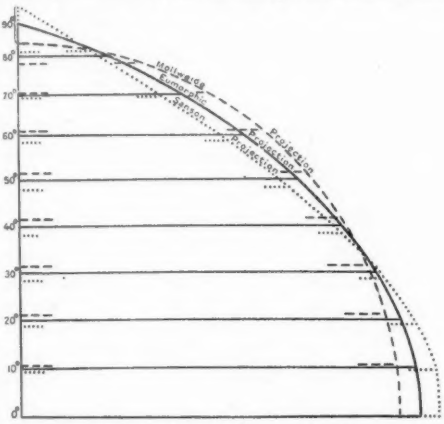


Figure 2. Comparison of the proposed eumorphic projection with the projections of Sanson and Mollweide

An independent feature (quite apart from the projection described above), which is designed to represent the shape of certain land areas with greater fidelity, may be introduced in mapping the world in the "interrupted" manner developed by Dr. Goode. This novel feature of construction is applicable to any projection with straight parallels of latitude and converging meridians, such as the Sanson and Mollweide projections.

It will be noticed that the more densely populated regions of the northern half of the eastern hemisphere (Eurasia and Northern Africa) have a peculiar relationship to latitude. The fact is that greater human importance attaches to the parts of Eastern Asia which lie *below* 40° north latitude, whereas, in the west, practically all of Europe lies *above* 40°. Approximately half of the world's population lives in Asia between latitudes 10° and 40°, and it would therefore appear highly desirable to preserve the shape of the land areas of China, Japan, and India as accurately as possible. A central meridian which does justice to Eastern and Southern Asia, however, results in very objectionable angular distortion in Europe.

I have, therefore, constructed an interrupted map (Fig. 3) with 60° east longitude as the central meridian from the equator to 40° north latitude, and have then shifted the central meridian of construction westward to 30° east longitude from 40° latitude to the pole. This "offset meridian" results in a slight angularity in the meridians along the 40th parallel, but the question is whether the appreciable improvement in the shape of the very important land areas concerned does not justify the innovation. The practical effect of the offset meridian is somewhat similar to that of the oblique projections

Figure 3. The projection of Figure 1 with interrupted meridians

which Mr. Hinks recommends for world maps, without losing the very desirable diagrammatic simplicity of straight parallels, and of meridians which are simple curves.

In any event, the writer hopes that the merits of the new projection which has been derived as a mean between the Sanson and the Mollweide projections will be appraised independently of the novel construction feature of the "offset meridian."

The derivation of the formulae, tables of coordinates and of angular and linear distortions are preserved in the Library of the Society.

A RETRO-AZIMUTHAL EQUIDISTANT PROJECTION OF THE WHOLE SPHERE: *A paper read at the Afternoon Meeting of the Society on 10 December by*

ARTHUR R. HINKS, C.B.E., F.R.S., Secretary R.G.S.

WHEN Mr. J. I. Craig, then of the Survey of Egypt, invented the projection which showed the azimuth of Mecca at any point on a map of the Muhammadan East, he opened up a new class of projections, the retro-azimuthal, whose property is the converse of the azimuthal, which preserve the true azimuth of any point from the centre of the projection. The retro-azimuthal, on the contrary, give the true azimuth of the centre from any point, which is useful to the Muslim in showing the bearing he should assume for his prostration to Mecca, and to the surveyor in giving the azimuth on which he must set his frame aerial to get a distant station sending time signals.

The azimuth of the centre from the point—the reverse or retro-azimuth—may be measured graphically from the meridian drawn through the point, as is easily done on Mr. Craig's projection, where the meridians are parallel straight lines, and the azimuth may be found at once with parallel ruler and compass rose. The stereographic projection is retro-azimuthal, as my old pupil, the late Captain Blake, once discovered independently at the end of a long piece of analysis which led to a result obvious geometrically when you knew it. But in this class of retro-azimuthal projections the azimuth must be measured from the tangent to the curved meridian through the point, and that is not so readily determined.

Mr. Craig's projection cannot be extended to so much as a hemisphere, nor the stereographic to cover the sphere. It is obvious enough that it must be possible to construct a retro-azimuthal equidistant projection of the whole sphere in which the reverse azimuth may be read upon the enclosing circle divided equally, just as the border of the usual zenithal or azimuthal projection might be divided, though it hardly ever is; but it was not so easy to forecast the form it would take. A more limited problem had been attacked analytically by Dr. C. Schoy in a paper in the *Annalen der Hydrographie* (September 1913, p. 466). He had got some distance with the solution, but the intricate equations for the meridians and parallels became unmanageable at great distances from the centre.

It occurred to me that it would be amusing to make a trial of Mr. Reeves graphical method by constructing the projection for the whole sphere, for

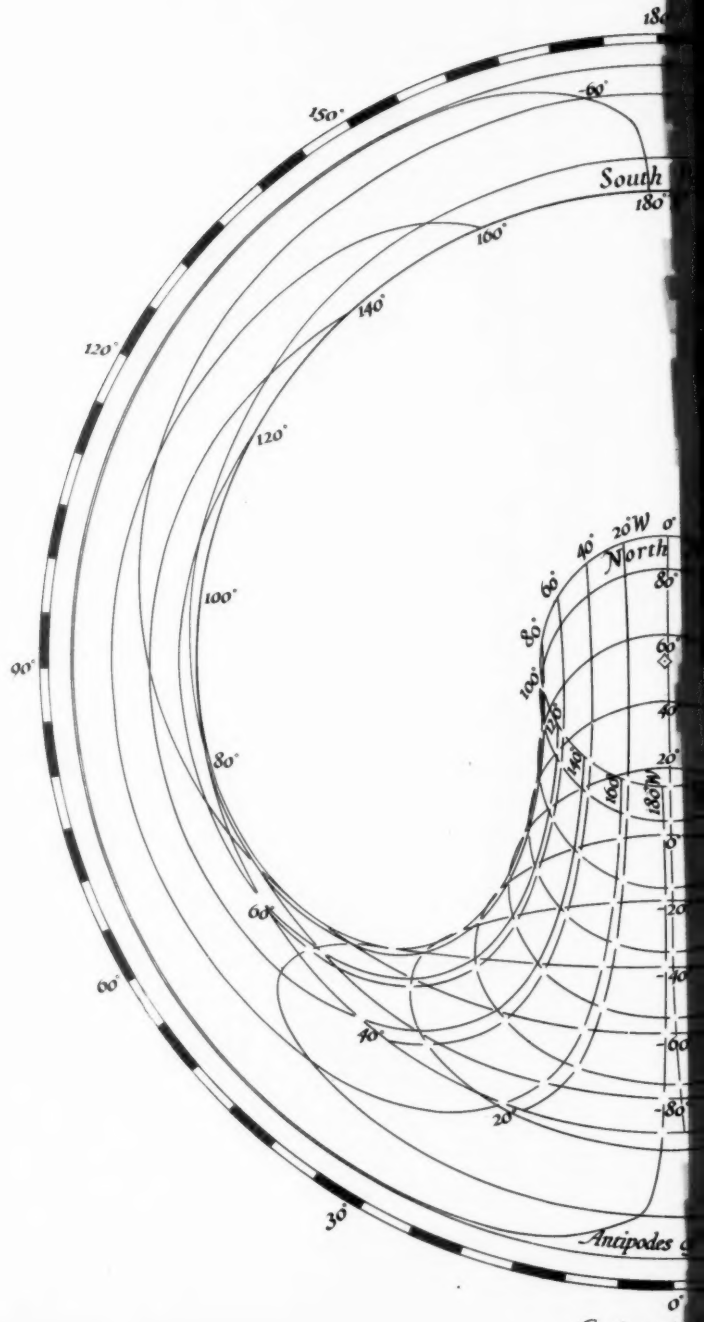
presentation to the International Geographical Congress at Cambridge, and a preliminary communication was made to the section of Mathematical Geography at their meeting on July 24. The graphical method proved itself convenient and rapid, with the great advantage over calculation that one could see at once where the curves would be defined by few points, and where their complexity or extent would require a great number.

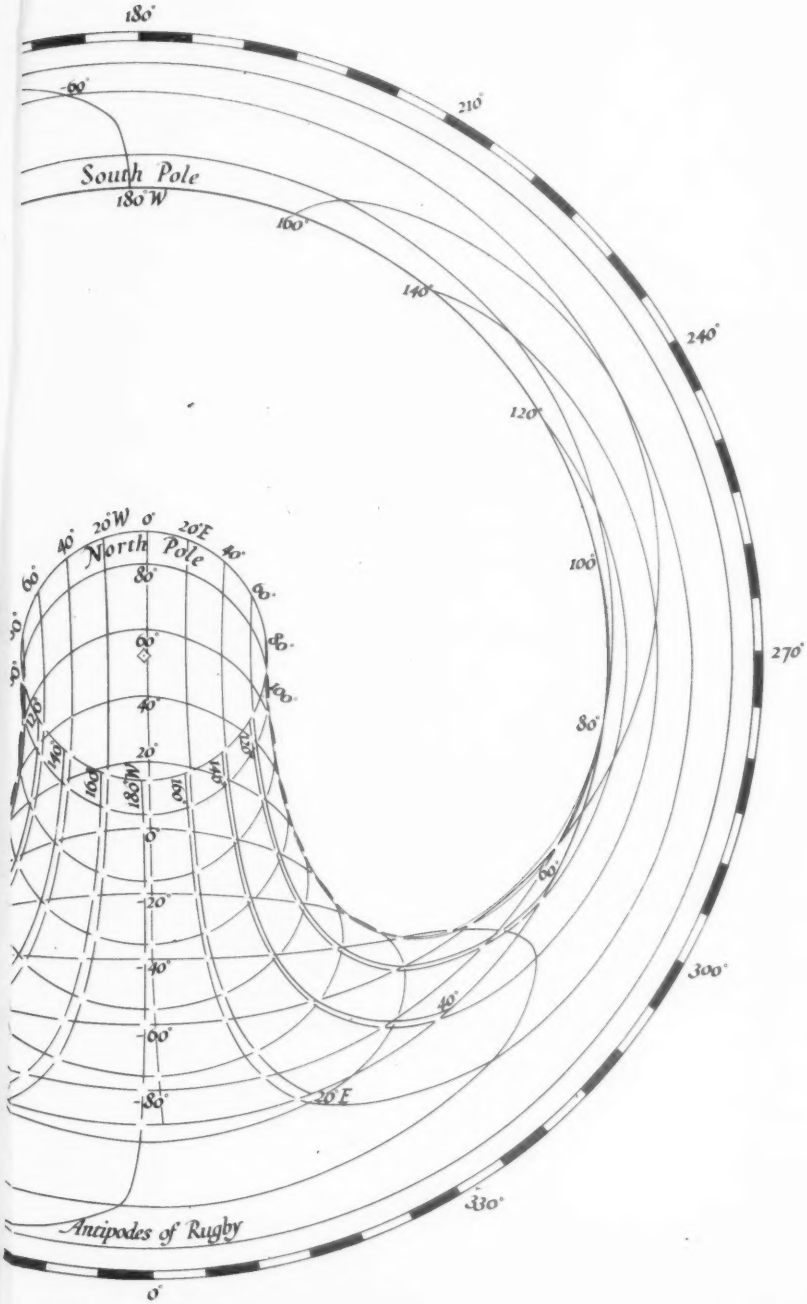
For centre of the projection I naturally chose Rugby, since its time signal is the only long-wave signal that is easily received in any part of the world. It is obvious enough that the antipodes of Rugby will be represented by the circle with Rugby as centre bounding the projection, but not at a first glance quite so obvious that the north and south poles will be concentric circles, nor that we shall have, for the first time I think, a projection with a closed boundary containing a large blank area which is no part of the projection. And what is more interesting, we have a construction which satisfies the definition of a map projection, that it shall be an orderly arrangement of meridians and parallels, though upon it one cannot possibly draw a map, because in parts it is so to speak folded back upon itself, and we have areas reversed and superposed on others. Yet this is no impediment to the use of the projection for which it was designed. We may at first sight feel that there is some difficulty in interpolating for our position where the lines of meridian and parallel are turned backwards, or where they are so widely and curiously spaced. But it will be seen that in the former case the reverse-azimuth is almost constant over a wide range of position; and in the latter that the position is so nearly antipodal to Rugby that the setting of the frame aerial is dictated by other considerations than the precise reverse azimuth: by the distribution of light and darkness, for example.

The projection with Rugby as centre has been made by the help of Mr. Reeves' diagram entirely, and no computation whatever has been necessary. It is, I think, a good example of the value of this diagram. The reverse-azimuths are probably right within half a degree or so, which is amply good enough for our purpose. As a general check on our results we may note one or two geometrical properties. A well-known theorem in spherical astronomy states that the parallactic angle of a star is a maximum when the star is upon the prime vertical. It is easy to see that this is equivalent to the theorem in our projection, that the reverse azimuth is a maximum for any parallel of latitude at the points where it cuts the great circle through Rugby at right angles to the meridian. If with the aid of Mr. Reeves' diagram we plot this great circle (which is not, of course, a straight line on the projection) it should be the envelope of the plotted parallels, and it will be worth while to construct it as a guide to the drawing. Where it touches the trace of the equator the reverse azimuth should equal the co-latitude of Rugby.

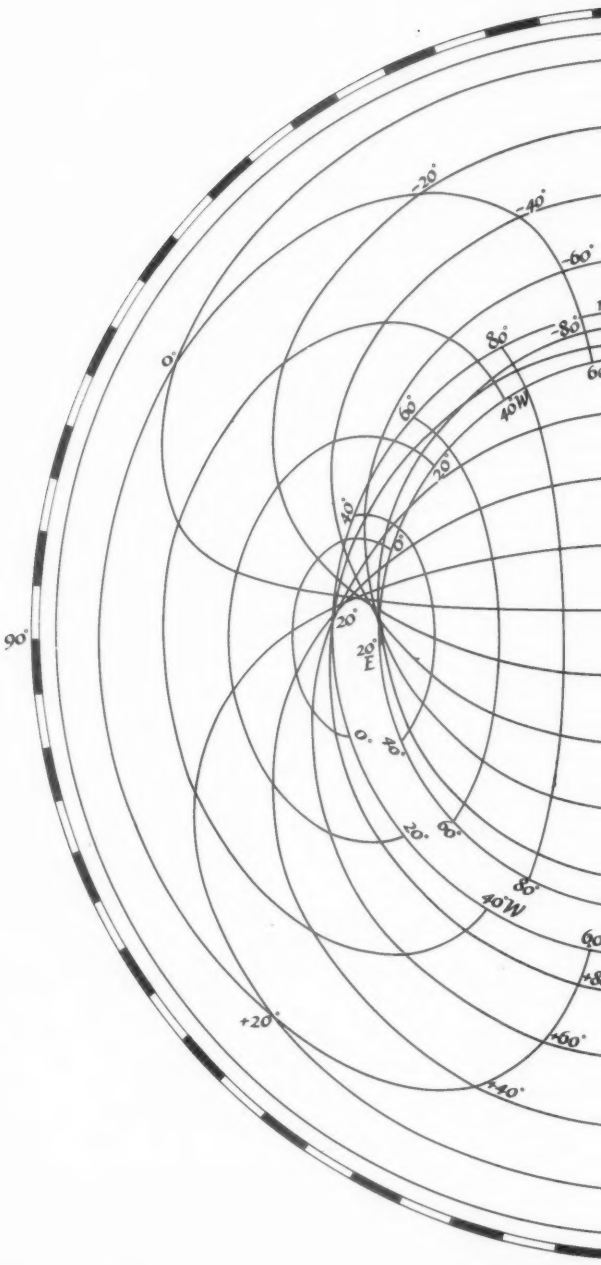
As the centre of projection approaches the north pole the north polar circle of the projection diminishes proportionately in radius and the south polar circle approaches the bounding antipodal circle. When the centre is at the pole the whole projection must evidently shrink up into a single radius of the latter, but the process by which the antipodal south polar circle is reduced to a single point at the extremity of this circle is not easy to realize.

As the centre of projection approaches the equator the north and south


South
North
Antipodes
Centre at



Centre at Rugby



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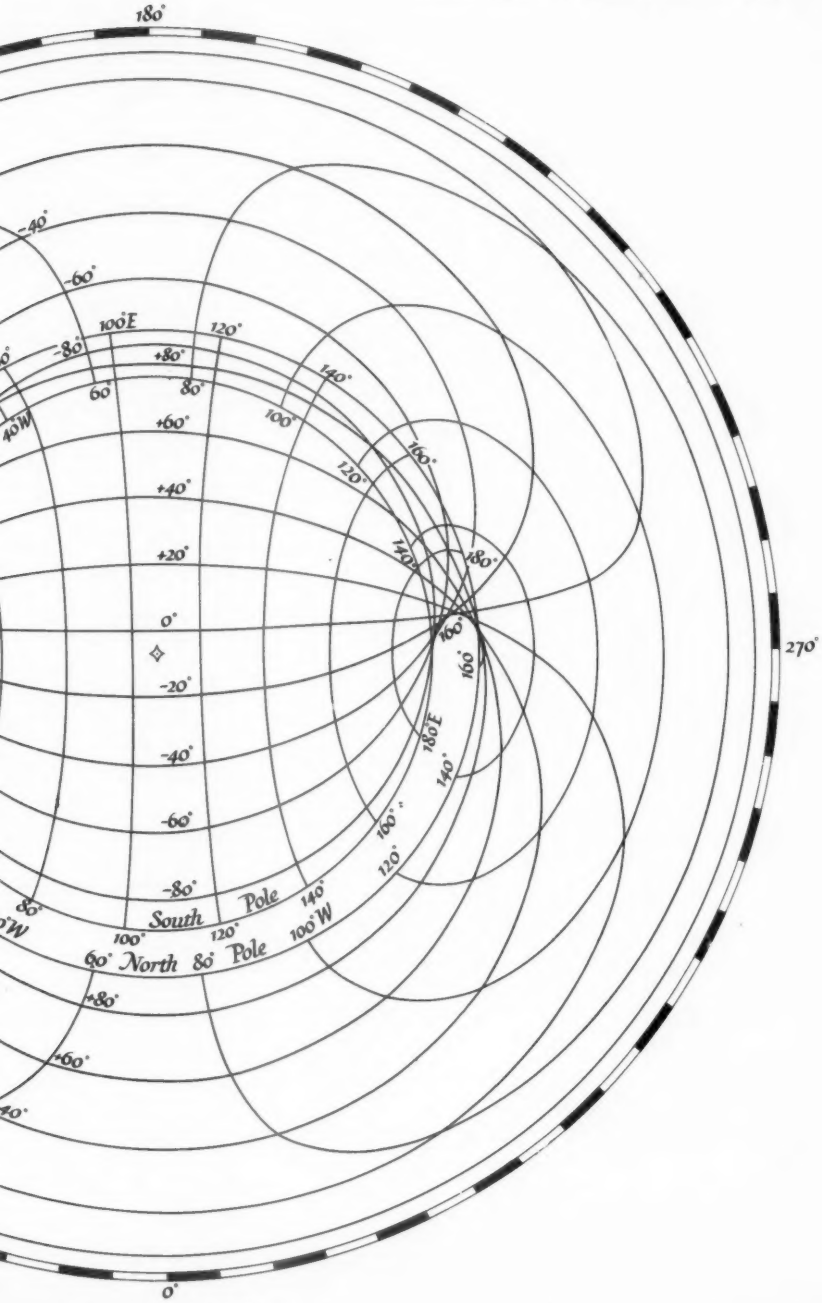
RETROAZIMUTHAL PROJECTIONS OF THE WHOLE SPHERE



Centre at Malabar

polar circles coalesce at half the radius of the antipodal circle, and the equator becomes a finite straight line, a diameter of this latter circle along the readings of back azimuth 90°–270°. It needs some imagination to envisage a map projection in which the north and south poles are coincident circles of which the equator is a diameter, and I suspect that it is more impossible even than ordinarily with this projection to draw a map upon the equatorial example. But it evidently has amusing properties which are worthy the examination of the curious, and for this reason I have made a second projection with centre Malabar, 7° south of the Equator, which is instructive.

A CHART SHOWING THE TRUE BEARING OF RUGBY FROM ALL PARTS OF THE WORLD: *A paper read at the Afternoon Meeting of the Society 10 December 1928, by*

E. A. REEVES
MAP CURATOR R.G.S.

AFTER Mr. Hinks' interesting projection with its unexpected and fascinating curves, the chart I have to show must appear a very tame and ordinary affair. It merely consists of an Admiralty Chart (W) containing an outline of the World on Mercator's projection, upon which I have had drawn the curves of Equal Reverse Azimuth of Rugby, and so produced a chart somewhat similar in general appearance to the Admiralty Chart of the World showing curves of Equal Magnetic Variation, but giving the true bearing of Rugby from all parts of the world instead of showing the variation of the compass. At all places on the same curve the true bearing of Rugby is the same, and by interpolating it is possible to obtain the bearing of that place anywhere to within a degree, and even nearer in parts. The curves are drawn at 5 degrees apart except in areas where there is little change of bearing, and there intermediate curves have been shown by broken lines. These bearing curves are reckoned in all cases from the true north point of the horizon, either east or west, up to 180 degrees. They are clearly numbered and marked E or W as the case may be.

By means of the "True Bearing and Distance Diagram" which I have recently arranged, and which the Society is now publishing as one of its Technical Series, it is possible to obtain very readily the bearing of any place on the Earth's surface from any other; and this diagram has been used in the construction of the present chart. The latitudes and longitudes of points where the true bearing of Rugby for every 5 degrees is the same have been taken from the diagram and plotted on the Admiralty Chart, and then joined by curves. Altogether a very large number of points were plotted in this way. The computations necessary to produce these curves in the ordinary manner would have been most formidable and lengthy, but with the "True Bearing and Distance Diagram" it took only a very short time to mark out the points and draw the curves.

Rugby has been chosen in this case, but of course, a similar chart could be produced for any other wireless transmitting station, or any place in the world for any desired purpose. I do not know what accuracy is considered satis-

factory or effective in religious orientation, but provided the bearing could be taken off near enough, which probably is the case, it would be quite easy to construct a similar sort of chart showing the true bearing of Mecca from all parts of the world.

This chart for Rugby which I have described will be published with the new edition of Mr. Hinks' 'Wireless Time Signals for Surveyors in the Field' (R.G.S. Technical Series No. 3), which is just about to appear.

NEW MAP PROJECTIONS: *Discussion on the papers read at the Afternoon Meeting of the Society on 10 December 1928*

Before the papers were read the PRESIDENT (Colonel Sir CHARLES CLOSE) said: This afternoon, gentlemen, we are to have a discussion on four different projections. I always think it is a very good thing that we have at least one mathematical subject in geography—there are others—which is quite fundamental to our subject. You will remember that the philosopher Kant said there was as much truth in any science of Nature as there was mathematics in it; though some may disagree with that dictum. Certainly a science which has no mathematics in it cannot have very much truth, or not very much of value or exactness. At any rate, we have a subject which is our own, a very valuable subject, and one which cannot be dealt with except by the mathematical method. We have previously had several discussions on map projections, and this afternoon we have four interesting papers to discuss. The first is a "New Map Projection," by Mr. S. W. Boggs, who is not present, but Mr. Hinks will read his paper.

Mr. Hinks then read Mr. Boggs' paper.

Professor FAWCETT: Do you know the relation of the projection described to that used for the world in, I think, Whitbeck's 'Economic Geography'? To the best of my memory Whitbeck used the Sanson-Flamsteed projection within 40° of the Equator; but he broke at that latitude and used Mollweide north and south of it. In speaking from memory I may have exchanged the two, but certainly he had a distinct stagger in the meridian.

Mr. HINKS: By changing the projection, not by changing the meridian?

Professor FAWCETT: By the use of a different projection. The interrupted Mollweide has been used fairly widely in American publications.

Professor FAWCETT: I used the interrupted Mollweide myself as an illustration a few years ago (in the *Sociological Review*, April 1926). I think I agree with Mr. Boggs that there is a great advantage in having lines of latitude as horizontal straight lines. It very much simplifies the comparison of climatic distributions. This is certainly a very interesting projection.

The PRESIDENT: I should like to ask Mr. Hinks if the net result is an equal-area projection—I mean the result of the final correction that he makes.

Mr. HINKS: Yes, because the constants are reciprocal to one another.

Mr. FAIRGRIEVE then, at the invitation of the President, exhibited and described the Oblique Mollweide projection recently published by him in *Geography* (No. 82, Autumn 1928, p. 525).

Mr. G. T. MCCAW: Mr. Fairgrieve has been endeavouring, as far as possible, to preserve the areas true. But am I correct in supposing that there is a considerable areal distortion in the neighbourhood of Australia? It seems to be too big compared with India, for example; nor am I quite sure that Canada is sufficiently large. Furthermore, the southern boundary of Canada, that is, the 49th parallel, ought not to be a straight line on the projection, nor is the frontage on the Pacific so straight as it appears. These are all minor points; but they seem

worth mentioning, though no doubt the map exhibited is intended to be no more than diagrammatic; moreover, these facts must not obscure the general interest of the method and its result.

Mr. FAIRGRIEVE: Obviously the southern boundary of Canada will not come in a straight line, because it should be in the 49th parallel. I think that is either my mistake or the cartographer's—I do not know which. I think it comes out fairly well equal area. It is only an approximation, and it is possible that something has gone wrong, though I do not think it is very far wrong. That north of Australia worried me very much.

Mr. HINKS: Have you measured those areas?

Mr. FAIRGRIEVE: They are fairly near the same area.

Mr. HINKS: If I followed your method of transformation from Mollweide this ought to be accurately an equal-area projection.

The PRESIDENT: I am interested in Mollweide. I think myself there is no difficulty in making this oblique version perfectly rigorous. Mr. Fairgrieve rather thinks that the central circle remains a circle?

Mr. FAIRGRIEVE: No, it would not be.

The PRESIDENT: There ought to be symmetry.

Mr. FAIRGRIEVE: But you will notice one thing which shows the symmetry of each side is not exact; the Equator and the corresponding meridian through the Poles are not symmetrical at this side and at the other.

The PRESIDENT: That depends upon what meridians were chosen, I suppose?

Mr. FAIRGRIEVE: Yes; 48 is the middle, which is not symmetrical.

The PRESIDENT: But there is no difficulty in making that projection perfectly rigorous. I think we are very much indebted to Mr. Fairgrieve for devising that pleasant projection. I think it gives a nice curved appearance to the Earth's surface which we do not get in the ordinary Mollweide.

Mr. Hinks then read his paper on the Retro-azimuthal Projection of the Whole Sphere.

The PRESIDENT: I should like to ask Mr. Hinks how he actually measures a retro-azimuth from any point.

Mr. HINKS: Take $-40°$ in latitude and 140° W. in longitude; draw a line from the central point and the azimuth is 23°. You divide the circular periphery just as if it was a compass. The same principle was used in the other diagram, but that not being completed had not a divided circle. It is a curious thing that zenithal projections are rarely divided on the circumference. It would be very useful if they were.

Mr. MCCAW: I think the Admiralty have drawn an azimuthal protractor on the antapex, the antipodal circle.

Mr. HINKS: I am glad to hear it. Have the Admiralty prepared a zenithal of the whole sphere?

Mr. MCCAW: Yes; and that is worth comparing with this projection, because, as here, the curves double round on themselves.

The PRESIDENT: I gather you can only draw the continents on this map by having one on top of the other?

Mr. HINKS: Yes; the thing turns back on itself, so that it is impossible to draw some parts of the world recognizably. I omitted to explain the reason why some of the intersections are broken. Owing to the fact that it is necessary to draw two things superposed upon one another, many of the intersections are perspective, and there little gaps have been left. Take the meridian of 160°; it cuts a parallel at a genuine point, and then apparently cuts another, but on the wrong side of the projection.

The PRESIDENT: Could you tell us, Mr. Hinks, if at Cambridge at the Geographical Congress there was any discussion on the subject?

Mr. HINKS: I do not recollect that there was, Sir. No, I think the projection was received there with some frivolity.

The CHAIRMAN: At any rate it has extremely interesting features.

Mr. Reeves then read his paper on A Chart showing the True Bearing of Rugby from all parts of the World.

The PRESIDENT: What is the latitude of your centre?

Mr. REEVES: Rugby—52° 22′ N.

The PRESIDENT: At the actual point of intersection the retro-azimuth would be the co-latitude?

Mr. HINKS: The four lines would cross at the co-latitude of the station.

Mr. REEVES: Yes, if I had taken 37° 38′ instead of 37° 30′ the lines would have crossed.

The PRESIDENT: At the Equator and 90° longitude from Rugby your retro-azimuth would be the co-latitude?

Mr. REEVES: Yes, that is so.

Mr. HINKS: I had not seen that chart until to-day, but it strikes me as being of very great interest. You will notice that there is a large indeterminate kind of area between 30° and 40° W. corresponding to my projection, where it doubles back upon itself. The form in which it comes in this chart is certainly a very great deal more intelligible than the way it is shown in mine.

Mr. G. T. MCCAW: I think we ought to congratulate Mr. Reeves on this graphical method of azimuths. It is certainly valuable, and I think Mr. Hinks' diagram, which he has told us is mostly amusing, might have a practical interest. The circumferential protractor on it enables one to take off bearings in a very simple way. I think there is much to be said for both charts. Both projections are free from the trouble of having to take a bearing off a meridian which is curved, a difficulty with which one is frequently faced in ordinary projections.

A FELLOW: I have been told that Aden is a blank spot as regards wireless telegraphy. It seems to me that might be an explanation.

Mr. MCCAW: It would be very interesting to compare the chart with actual observations made at places such as Aden, because it is found that the signals come in at extraordinary angles in certain cases. Probably in Asia there are localities where there are extreme variations. The two "blind spots" on the Equator at longitudes differing by 90° from the longitude of the transmitting station have been previously noted.

Mr. HINKS: It would be interesting to have observations near the antipodes as to what actually happens.

The PRESIDENT: There are two poles—one each side of the chart.

Mr. HINKS: That is the antipodes of Rugby.

The PRESIDENT: Well, we have had some very interesting papers, and I think even the most fantastic of the projections given us by Mr. Hinks may one day prove to be useful. You never can say what is going to be useful in science. I am particularly glad to see that so much interest is being taken in projections; in fact, it is quite difficult to keep up with what is going on on the subject. I hope one day all the various studies will be collected together and that somebody who has more time than most of us here will publish a complete book on the subject. I thank all those who have contributed to the discussions this afternoon, and particularly the readers of the papers, Mr. Fairgrieve, Mr. Hinks, and Mr. Reeves, and also Mr. Boggs, whose paper Mr. Hinks has kindly read to us.

AN OBLIQUE MOLLWEIDE PROJECTION OF THE SPHERE

COLONEL SIR CHARLES CLOSE, K.B.E., F.R.S., SC.D., PRES. R.G.S.

IN the issue of *Geography* for the Autumn of 1928, Mr. J. Fairgrieve gave a brief account of an oblique Mollweide Projection of the Sphere in which the new Pole is placed on the central circle of the original Mollweide, only at the old latitude of 45°. Mr. Fairgrieve gave a rough diagram of the projection, which is of an interesting character. He also kindly attended the Afternoon Meeting of the R.G.S. on December 10, and described the projection.

The writer of this note thought that Mr. Fairgrieve's projection would be worth further study, and accordingly he computed the coordinates of a network for meridians and parallels at every 30°. The following are the main features which result from this study:

(1) The old central circle remains a meridian on the new projection, and it is the meridian 90° from the "principal meridian."

(2) The principal meridian may be defined as that which passes through the centre of the bounding ellipse; this principal meridian and the Equator of the new projection are similar curves, inverted with respect to each other, each passing through the centre of the ellipse and each terminating at the ends of the major axis.

(3) The new parallels of 0°, 30°, and 60° north touch the old parallels of 45° north and south, 15° south and 75° north, and 15° north and 75° north; and similarly with the southern parallels.

To compute the coordinates all that is required is to find the simple expressions in spherical trigonometry connecting the latitudes and longitudes, on the sphere, with the old pole and with the new. We can thus get the values of the old latitude and old longitude for each point defined by latitude and longitude on the new projection.

If S is any point on the sphere and it is required to transform the spherical coordinates (lats. and longs.) from a pole P_1 to a new pole P_2, 45° distant, and on the old meridian of 90° W., λ_1, L_1 being the old coordinates and λ_2, L_2 the new, then

$$\sin \lambda_1 = (\sin \lambda_2 - \cos \lambda_2 \sin L_2)/\sqrt{2} \quad . \quad . \quad . \quad . \quad . \quad \text{(i)}$$

and

$$\cos L_1 = \cos L_2 \cos \lambda_2 \sec \lambda_1 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad \text{(ii)}$$

From (ii) it follows that if L_2 is 90°, L_1 is also 90°, *i.e.* the central great circle remains a meridian.

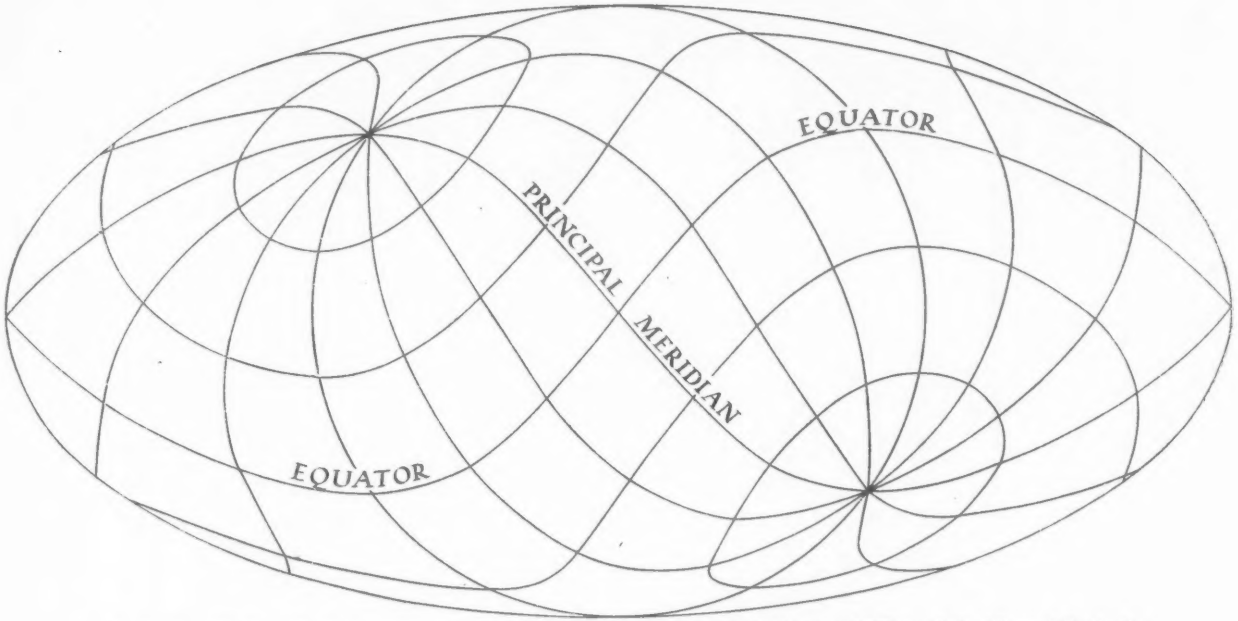
Of course the rectangular coordinates of a point $\lambda_1 L_1$ of the original Mollweide are found in the usual way

$$2\phi + \sin 2\phi = \pi \sin \lambda_1$$

and the rectangular coordinates of a point on the central circle are $\cos \phi$ and $\sin \phi$.

The Secretary has suggested that it may be useful to give the general expressions for the transformation.

Case I.—Let P_2 be taken in lat. θ and long. ϕ west of the central meridian in the normal projection; E the centre of the projection. Then by definition P_2E is the Principal Meridian.



The oblique Molleweide Projection with pole transferred to the point 45° North 90° West of the Normal Projection

If $P_1P_2E=\rho$, $\tan\rho=-\tan\phi\ \mathrm{cosec}\ \theta$

and from the triangle P_1P_2E

$$\sin\lambda_1=\sin\lambda_2\sin\theta+\cos\lambda_2\cos\theta\cos(\rho+\lambda_2)$$

$$\frac{\sin(\phi-L_1)}{\cos\lambda_2}=\frac{\sin(\rho+L_2)}{\cos\lambda_1}$$

whence λ_1 and L_1 can be calculated easily, given θ, ϕ, and calculating ρ.

Case II.—If $\phi=90°$, *i.e.* P_2 is on the 90° meridian of the normal projection,

$\rho=90°$ and $\sin\lambda_1=\sin\lambda_2\sin\theta-\cos\lambda_2\cos\theta\sin L_2$

$$\cos L_1=\cos\lambda_2\cos L_2\sec\lambda_1$$

Case III.—If $\theta=45°$ as in the projection here calculated,

$$\sin\lambda_1=(\sin\lambda_2-\cos\lambda_2\sin L_2)/\sqrt{2}$$

and $\cos L_1=\cos\lambda_2\cos L_2\sec\lambda_1$ as before.

The chords joining pairs of points on any parallel with equal and opposite differences of longitude from 90° or 270° are parallel to the major axis of the ellipse. This is true for any value of θ.

And when θ is 45° the chords joining points on the equator with longitudes $90°\pm\theta$ are not only parallel to the major axis but collinear with points on the principal meridian with latitudes $\theta-90°$. These properties furnish very useful checks on the accuracy of the drawing.

TABLE FOR THE OBLIQUE MOLLWEIDE PROJECTION WITH POLE TRANSFERRED TO $\lambda+45°$, $L+90°$ OF THE NORMAL PROJECTION

Intersections of Meridians and Parallels of the Oblique Projection in terms of Latitudes (λ_1) *and Longitude* (L_1) *on the Normal Projection, which can be converted into rectangular coordinates by the table given on p. 321 of Germain.* L_1 *is reckoned positive when measured to the west of the principal meridian.*

Meridians L_2	*Parallels* $\lambda_2+60°$		$+30°$	$0°$
$+90°$	λ_1	$+15°\ 0'$	$-15°\ 0'$	$-45°\ 0'$
	L_1	$+90\ \ 0$	$+90\ \ 0$	$+90\ \ 0$
$+60°$	λ_1	$+17\ 50$	$-10\ 11$	$-37\ 46$
	L_1	$+74\ 45$	$+63\ 54$	$+50\ 46$
$+30°$	λ_1	$+25\ 49$	$+\ 2\ 43$	$-20\ 42$
	L_1	$+61\ 15$	$+41\ 17$	$+22\ 14$
$0°$	λ_1	$+37\ 46$	$+20\ 42$	$0\ \ 0$
	L_1	$+50\ 46$	$+22\ 14$	$0\ \ 0$
$-30°$	λ_1	$+52\ \ 6$	$+41\ 17$	$+20\ 42$
	L_1	$+45\ 11$	$+\ 3\ 36$	$-22\ 14$
$-60°$	λ_1	$+66\ 43$	$+62\ \ 7$	$+37\ 46$
	L_1	$+50\ 46$	$-22\ 11$	$-50\ 46$
$-90°$	λ_1	$+75\ \ 0$	$+75\ \ 0$	$+45\ \ 0$
	L_1	$+90\ \ 0$	$-90\ \ 0$	$-90\ \ 0$

To extend these columns up and down to $\pm180°$ repeat the λ_1's in reverse order outwards, and subtract the L_1's from $\pm180°$ according as L_1 is positive or negative. Thus for Meridian $-120°$, parallel $+60°$, λ_1 is the same as for meridian $-60°$, and L_1 is $180°-(50°\ 46')=129°\ 14'$.

To make the columns for the southern parallels, change *all* signs.

SIR HUBERT WILKINS' DISCOVERIES IN GRAHAM LAND

AS reported in the *Times* on 21 December 1928, and confirmed by later telegrams, Sir Hubert Wilkins, by a flight of 1200 miles from his base at Deception Island to about lat. 72° S. and back, has proved the insularity of Graham Land. It can no longer be regarded as a large-scale peninsula, jutting north from the main plateau mass of Antarctica, but is in reality two large islands separated from lands farther to the south by an ice-filled channel 40–50 miles broad. The new discovery is perhaps the most important in Antarctica since Shackleton in 1908–9 ascended the Beardmore Glacier to the great Antarctic Plateau. For the first time an aeroplane has been flown over the Southern Continent; but apart from this the expedition marks more than one new departure in Antarctic exploration. Preliminary arrangements took less than three months; expenses were cut down to a minimum by arranging for transport by a Norwegian whaling factory; and the personnel more immediately engaged in the venture was limited to four. Sir Hubert sailed from Monte Video in the *Hectoria* on October 24 with Lieut. Eielson (pilot), Crossan (second pilot), and Porter (mechanic) as his companions, and two Lockheed monoplanes, one of which (the *Los Angeles*) had been used on the Alaska–Spitsbergen flight last April. The *Hectoria* touched at the Falkland Islands on October 30, and Deception Island was reached on November 4. It was some days apparently before the machines could be landed: then difficulties centred over the most suitable type of under-carriage. During trial flights it looked as if skis—necessary in the event of a forced landing—could be used for the final take-off. Summer conditions, however, arrived sooner than had been anticipated, and in the absence of a proper snow-surface it was decided to use the *Los Angeles* fitted as a seaplane. In the end repeated attempts to get off with the seaplane on December 18 were unsuccessful. Equipment was hurriedly transferred to the second machine, the *San Francisco*, fitted with wheels (which ruled out any possible landing), and she finally took the air from a specially prepared runway on December 19. The expedition had now been over a month at Deception Island, and during that time had experienced little else than thaw conditions. In the absence of fuller data it is quite possible that these are normal round Deception Island during the Antarctic summer. Until December 18 and 19 there had been only one reasonably fine day in a period of six weeks.

Crossing Bransfield Strait the *San Francisco* climbed to a height of about 8000 feet. Graham Land was then seen to be a narrow but continuous tableland deeply indented by fjords on both sides. Between 66° and 67° S. "a level ice shelf following a twisted channel cuts Graham Land in half": it is proposed to name this new-found strait Crane Channel. At its east end was an island immediately south of and larger than Weather Island. South of Crane Channel the tableland ceased, the land surface appeared much more irregular, and the mountains were often triangular shaped. A second strait, provisionally named Casey Channel, was found in about lat. 70° S. Numerous new islands were seen between 69° 30′ and 71° S.: while beyond was the great ice-filled strait, 40 to 50 miles in breadth, which it is proposed to call Stefansson Strait. The islands seen latterly had rounded low mountains and gentler slopes; the machine flew at about 2000 feet altitude. South of

Stefansson Strait was an ice-cliff running like a "roughly pencilled line" to the far horizon: beyond was an "unbroken slope southward as far as the eye could see;" Sir Hubert believes that the latter (for which he proposes the name Hearst Land) is the Antarctic Continent proper, from which Graham Land is now shown to be separate. Wilkins and Eielson had now been flying for more than five hours and had covered a distance of about 600 miles. The wheels as under carriage made any landing quite out of the question. The return was therefore made direct to Deception Island, and at increased speed to avoid bad weather which was seen coming up from the west. Over South Graham Land the course appears to have followed the meridian of 63° W.

According to later telegrams a second but shorter flight was made in the *Los Angeles* on January 10 with Crossan as pilot and seaplane floats. Clouds, however, interfered somewhat with the programme, which was to prospect for a more suitable base accessible by ship and where skis could be fitted. The chief difficulty throughout appears to have been the lack of snow at Deception Island: that the expedition remained there in spite of this disadvantage may perhaps be due to the *Hectoria* having at once become fully occupied as a whaling factory, the attendant whale catchers not being large enough to carry the planes and push forward the base into a more suitable region. Following the second flight Sir Hubert decided to store his machines at Deception Island. A telegram to the *Times* published on January 28 indicates that this has been done, and that the party was about to leave for Port Stanley in the *Flerus*, the Government ship which each year visits the Falkland Island Dependencies in connection with whaling supervision. This year's flight, important as the results are, is therefore regarded merely as a preliminary, and it is hoped next season to carry out the original plan of a complete flight along the south edge of the Pacific from Graham Land to the Ross Barrier.

The new discoveries, apart from general interest, mean most to the tectonic geologist. The idea of a Graham Land mountain range running to Edward Land had long been held. Amundsen's discoveries in 1911–12 and the progress of geological knowledge considerably modified the earlier views, and more recent opinion favoured a mountain range swinging out to the Pacific between Graham Land and Edward Land. Sir Hubert Wilkins' discoveries suggest perhaps further modification. Certainly they show that there is no continuous range running due south; it appears rather that a mountain arc may continue south-west from Graham Land as an intermittent chain of mountainous islands via or to the south of Charcot Land, swinging much more to the west than was formerly imagined. Fresh interest attaches therefore to the region between Hearst Land and Charcot Land. The newspaper reports hardly allow of more being said on this matter, though it is worth adding that cliffs with bedded appearance were seen on South Graham Land, and are provisionally claimed as sediments.

The preliminary accounts leave one important point unsettled. Is Stefansson Strait permanently ice closed or not? The "roughly pencilled line" definitely suggests barrier-cliffs above pack-ice. If the pack-ice were permanent, it is doubtful if such a sharp line would persist. There is other

evidence, however, for the Strait being probably open and navigable from time to time. In the correspondence columns of the *Times* on January 5 there was published a letter written early in October last describing how two captains in the employ of Messrs. Chr. Salvesen and Co. of Leith had reached the south-west point of Fallières Coast in February 1924 and reported an open gulf stretching eastward for "at least 100 miles." This would appear to be the west end of Stefansson Strait. A strait such as this open from time to time also offers an explanation of Captain Larsen's unexpected voyage to 68° S. in the Weddell Sea early in December 1893. Larsen's reaching such a high latitude early in the season could readily be explained if in light ice years the Weddell Sea pack escaped without much difficulty to the west as it might through Stefansson Strait. The drift of Shackleton's *Endurance* shows the extreme conditions in a heavy ice year, when Stefansson Strait would be completely blocked.

Sir Hubert Wilkins' discoveries direct attention not so much to the west coast of Graham Land, but rather to the east coast, his aeroplane course being in the main on that side along the 63rd meridian. An attempt has therefore been made to plot the new lands in relation to those seen by Larsen in 1893. A few words on the latter's voyage are, however, necessary. An account was published in the *Geographical Journal* in October 1894, being a translation, not too accurate, of Larsen's original Journal. A more satisfactory description, however, is that given by Johannes Petersen in the *Mitteilungen der Geographischen Gesellschaft in Hamburg*, 1891–92 (published 1895). If these two papers are read in conjunction it will be seen that Larsen confined the name Foyn Land to "four hills which are free of snow on their northern and eastern slopes" and which lie approximately on the Antarctic Circle. To the coast farther south Larsen himself gave no name, although it has since been usually called Foyn Land. Some confusion has also been caused by Larsen's use of the term "ice barrier." At the time of his voyage little was known of the Ross Barrier, and the word "barrier" had a much looser significance than it has to-day. Larsen's Journal, however, and Nordenskjöld's later voyage in 1902, make it clear that south from 66° S. lat. (Cape Framnaes) he was sailing along the coast proper—a point not fully recognized on Admiralty Chart No. 3175. Some years after Larsen's voyage, Otto Nordenskjöld sledged over the ground north of 66°, and was able to show that there the "ice barrier" is a real barrier (or shelf-ice) comparable with, but lower in height, than the Ross Barrier. Shackleton took the further step on the map which accompanies *South* of calling this "low ice terrace" the Nordenskjöld Barrier. Nordenskjöld's discoveries showed further that Larsen's positions were probably too far to the east. If the errors of longitude are considerable it will of course increase the difficulty of definite identification of the mountains seen by Larsen with those seen by Wilkins, and a great deal will depend on the accuracy of position which can be claimed for the aeroplane during flight. Wilkins' successful navigation in the Alaska–Spitsbergen flight in April 1928 suggests, however, that his observations will have definite position value and an accuracy considerably greater than Larsen's.

Space in some cases and in others uncertainty have prevented all Sir Hubert's names being placed on the conjectural map. Two names, however, are pur-

posely omitted: Evans Inlet (of Wilkins) appears to refer to Nordenskjöld's Richthofen Valley; the other, Mt. Napier Birks, coincides at least on the present map with Larsen's Foyn Land. Wilkins refers to Mt. Napier Birks as a conspicuous double mountain; Larsen, on the other hand, describes Foyn Land as four hills constituting a very conspicuous landmark. It is therefore most doubtful if they are the same; and there is, in fact, considerable probability that Larsen's Foyn Land is represented by Wilkins' New Island. At any rate its conspicuousness, stressed by Larsen, will prove a valuable key to correlation of the different discoveries. Possibly Mt. Napier Birks is in reality Larsen's Mt. Jason: but here again there is considerable difficulty, as Larsen himself, on a later voyage (1902), appears to have been willing to accept certain nunataks near Cape Framnaes as representing Mt. Jason. On the accompanying map an effort has been made to show all these difficulties as clearly as possible: it should be emphasized, however, that the coasts shown, particularly round Casey Channel and Stefansson Strait, are based only on newspaper reports.

The new discoveries raise once more the debated question of the names of the larger features in this part of Antarctica, and it is much to be hoped that Wilkins' map will now make a final settlement possible. Though not perhaps entirely justified, Graham Land about thirty years ago became the general name for the whole mainland: the claims of "Palmer Land" and "Trinity Land" were recognized by applying them to the Palmer Archipelago and Trinity Island. That a general name was more than ever necessary followed automatically when the Falkland Islands Government took over control of these remote dependencies. One may ask, however, what will be the position now that Crane Channel cuts Graham Land in two. Will the general name remain, or will North Graham Land and South Graham Land (as Wilkins calls them) require separate names? If so, it is not inappropriate to suggest that Larsen himself should not be forgotten. Whatever the outcome it is very desirable that Sir Hubert should at once give the Admiralty full opportunity to make use of his original maps, for incorporation in the next edition of the Graham Land Chart (3175). It is that chart which is the basis of the present sketch-map; but those particularly interested should know that Chart 3175 is at present appearing almost annually as a new edition; the latest, issued in February 1928, contains the results of surveys made on board the *Discovery* in 1927; but considerable modifications are again due on the result of further work at present being carried out by an Admiralty survey party acting for the *Discovery* Committee.

NOTE: In the newspaper reports, "Findley Is." is obviously a slip for "Finley Is.," they being named after Mr. J. H. Finley, the President of the American Geographical Society; the name has been spelt thus on the map.

J. M. WORDIE.

THE MACKAY EXPLORING EXPEDITION, CENTRAL AUSTRALIA, 1926

DONALD MACKAY

THE primary object of the expedition was to fill in a blank that remained in the south-western corner of the map of the Northern Territory; to visit and verify the positions of ranges and hills which early explorers had seen in the distance and placed by estimation on the map; and to examine this country and form an opinion of the possibilities, if any, which it possessed from a pastoralist's standpoint.

In 1874 the great explorer Ernest Giles hurriedly traversed the region lying south-west from Lake Amadeus, but his observations were so meagre that the South Australian Government advocated a thorough exploration of this region. The knowledge that since the Giles expedition in 1874 two expeditions had set out to explore the Petermann Ranges and failed added interest to the present undertaking. The first of the expeditions set out in 1900, led by W. Warman; after reaching the Mann Ranges one of the party was killed by the natives, and the expedition returned. In 1906 the South Australian Government sent out a strong expedition under the leadership of R. George. This expedition also returned without attaining its objectives, two of the party having been speared by the natives.

Our party consisted of Dr. Basedow, Surveyor and Geologist; H. Oliffe and F. Feast, in charge of transport and camp equipment; and myself. We left Adelaide, S.A., by train on May 20; arrived Oodnadatta 22nd at 2 a.m., and picked up three black boys, Barrows Creek natives. The next day we left by motor truck for Charlotte Waters, arriving at 9 p.m. on the same day. The camels with heavy equipment arrived from rail-head at 4 p.m. on the 25th, I was disappointed to find that the camels were much poorer than I had expected, but knowing that good rain had fallen at Alice Springs and other telegraph stations along the Overland Telegraph line, I naturally expected that we would strike good feed later on, and, as the load per camel was light, as camels-loads go, I thought that the team would soon pick up. If I had known the state of the country that lay ahead of us I doubt if I would have started with such a team. Later we found that the good water in Ayers Range and Kelly Hills, which had been a big asset to the Wells Expedition (of which Dr. Basedow was a member), was either dry or covered over with a large quantity of sand. Drought and rabbits had certainly made the country between Charlotte Waters and Petermann Range most inhospitable.

From a pastoral standpoint I fear the country traversed by the expedition has no future owing chiefly to the uncertain rainfall. At Oodnadatta and Charlotte Waters, the nearest points where the rainfall is registered, the average is 5 inches. West of these places it would probably be less. The Wells Expedition, which was out in the Musgrave and Mann Ranges for nine months, recorded a fall of 10 points only. During the present expedition about the same amount fell, but the shower was only local. Travelling west from Charlotte Waters one soon passes out of the artesian area, though sub-artesian supplies might be struck. Even if the difficulty regarding water could be overcome an equally serious difficulty has arisen, namely, rabbits, which have gone over this country in a wave, eating out much of the natural feed.

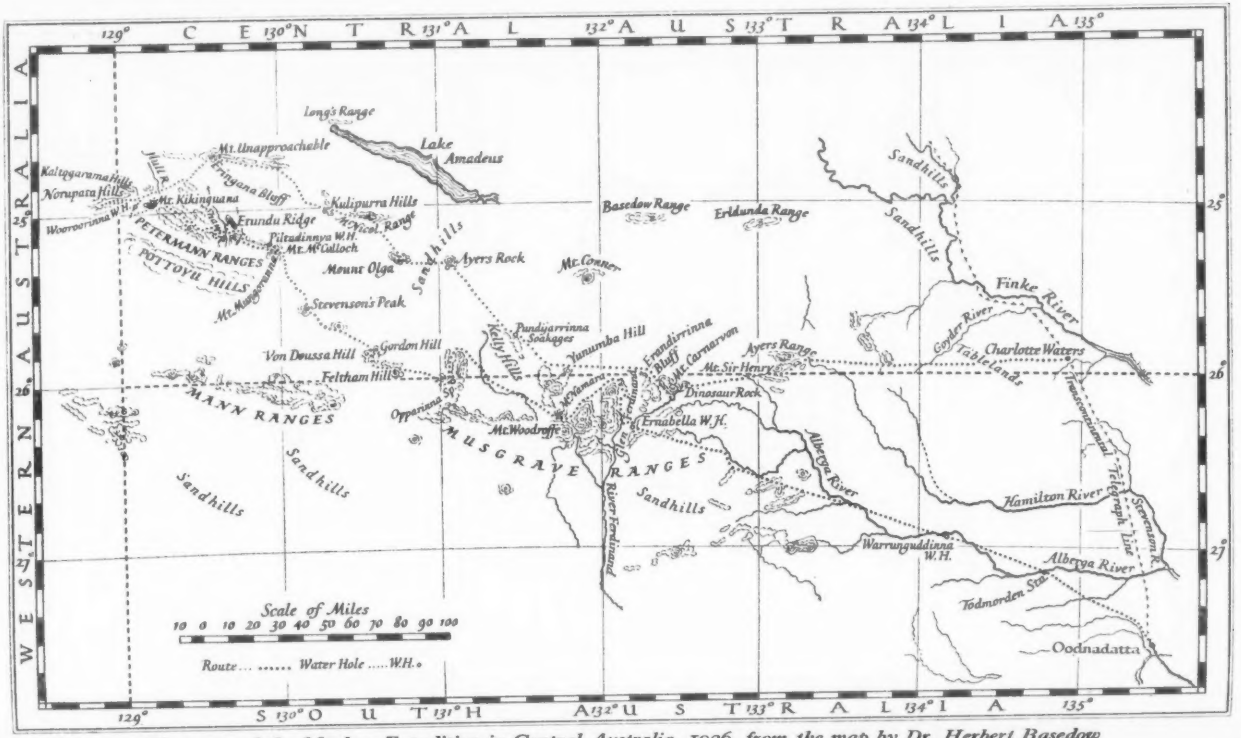
Saltbush in most of the country traversed has been destroyed and large areas of mulga are dead, having been ringbarked by the rabbits. Only in one small area in the Musgrave did we see any young mulga. By experience gained in New South Wales one realizes that the set-back caused to the rabbits by drought is only temporary, and although probably 90 per cent. of those that were in the country between the overland telegraph line and Petermann Range, Western Australia, are now dead, within twelve months after the next good rain they will again overrun the country and eventually deplete Central Australia of all pasturage.

Profiting by the experience of Giles and George, we took an extra large supply of water. Eight camels carried 270 gallons in galvanized iron drums, six camels carried provisions in pack-boxes, two camels carried flour, and two drew a back-board buggy. Dr. Basedow and myself had one each for our private accoutrements, four were in daily use for riding, while the others ran loose. The stores included 500 lbs. flour, 900 lbs. tinned meat. During the journey one bullock bolted and was not recovered, one cow died, and one was so badly staked that it was of no further use. The scientific equipment included a Watts light mountain 3½-inch theodolite, sextant 6-inch arm and artificial horizon, compensated aneroid barometer, prismatic compasses, distance measurers, super-heterodyne wireless set, and complete photographic, cinematographic and phonographic apparatus.

The expedition left Charlotte Waters (latitude 25° 56′, longitude 134° 55′, height above M.S.L. 645 feet) at 2.15 p.m. on 27 May 1926. Taking a westerly course we arrived at Ayers Range on June 3, 110 miles from Charlotte Waters. During this stage we had some difficult travelling while crossing tableland country, especially on the fourth day after starting. The day previous we had struck the start of what is locally known as Gibber country. This was undulating, the surface to a large extent covered with stones; but on the fourth day we came to a huge depression. In it were many table-topped hills intersected by dry creeks. We had considerable trouble in getting the camel buggy down the side of the depression. Before reaching the opposite side next day we had to make thirty crossings of the main dry watercourse and its tributaries.

On arriving at Ayers Range on June 1 we experienced a heavy frost and found, to our disappointment, that a good " soakage " visited by the Wells Expedition was completely covered over by sand. However, a mile farther on we came to the native well Kurrekapinya. This is on the eastern outskirt of Ayers Range, at the foot of a bare granite hill named by Giles the Turtle Back. The water is about 5 feet below the surface, with apparently a very poor flow. We tried to clean the well out, but failed, as the sandy sides kept falling in. A Blood wood tree was found on the south-east side of Turtle Back rock bearing the marks N.W.P.E. 5—80.

As the country was devoid of feed, I decided to make for the Musgrave Range, and at 1.15 p.m. on the 6th left for Mount Sir Henry, where we found a good camp, but unfortunately we lost two camels here: one bolted and could not be recovered, and one died. Passing round the eastern end of Mount Sir Henry, we expected to get water at a rock hole which held a good supply when visited by the Wells Expedition, but it was now dry.



The route of the Mackay Expedition in Central Australia, 1926, from the map by Dr. Herbert Basedow

From this camp Mount Carnarvon (The Sentinel) lies slightly south of west, distant about 45 miles. Much of this travelling was very laborious, as we had to clear our way through dense belts of mulga. Tietkens' Birthday Creek is a broad and sandy waterway fringed with gum and mimosa trees, but from appearance a considerable time must have elapsed since it had been a running stream. We followed it down for a mile and camped at the native "soakage" known as "Parlga." Three hundred yards north of our camp lay a serrated granite ridge which we named "Dinosaur Rock." To the north of west lay the Sentinel standing out in bold relief, reddish granite bare and smooth, with belts of mulga round its base and extending up where any crevice would contain soil. Travelling round the southern foot of the Sentinel a north-westerly course brought us to the north-eastern extremity of the Musgrave Range. From Erandirrinna Bluff, the course being then due west, the mulga scrub again made progress difficult until arriving at Yunumba Hill, when we were obliged to remain a day as one of the buggy camels had been badly staked and another had to be broken in. From this hill we got a fine view of Mount Conner on the north-east, looking like an immense ship in a sea of mulga.

On June 15 we left for the Kelly Hills, our course being north-west, passing through a considerable amount of porcupine grass and poison bush. At night we had to tie up the camels in case they ate the latter. The nights were now very cold, the thermometer registering at 7 a.m. 27° Fahrenheit. The country was in a deplorable condition through the want of rain. In the Kelly Hills we visited Pundijarrinna Soak, but found it dry. Between here and Ayers Rock, nearly 40 miles, is a succession of sandhills intersected by level patches, the former being composed of yellow drift sand covered with spinifex desert oak, and occasionally between the sandhills were thickets of mulga. On June 19 we arrived at Ayers Rock, probably the most awe-inspiring spectacle of Central Australia. This huge rock rises with precipitous sides out of the surrounding plains. It is 4 miles round, over 1000 feet high, and practically unscaleable, though an expert mountaineer might make an ascent on the south-west end. It is composed of metamorphic grit. In places its sides have been eroded, forming grottoes in which are numerous ochre drawings by the aboriginals. There are several rock holes containing a good supply of water. Maggie's Spring, so named by Giles, contains a permanent supply, although in reality it is not a spring, being fed from a reservoir on top of the rock, the water escaping probably through some crevice. Leaving Ayers Rock our course lay west to Mount Olga. This involved heavy travelling, as many sandhills had to be crossed and near Mount Olga there is much mulga and loose stony country. We found good water at the foot of the main elevation, or western end, of this group of altered conglomerate hills, and also in a gorge on the northern side.

Leaving Mount Olga we travelled north, reaching in 25 miles what Dr. Basedow decided was McNicol Range, composed of five dome-shaped hills. Here, as wherever practicable, Dr. Basedow and I climbed to the highest point to take observations. On leaving, thirty-five natives joined our party and came with us as far as Kulipurra Hills, where they showed us a rock hole containing a small supply of water. Our next objective was a prominent hill

The route of the Mackay Expedition in Central Australia, 1926, from the map by Dr. Herbert Basedow

north of west, where we arrived four days later. This hill was called "Eringana" by the natives, two of whom still accompanied us. Leaving the hill we came on a camp of natives, but were unable to get in touch with them. The ascent of "Eringana" was an arduous undertaking, the surface being steep and composed of loose quartzite. Dr. Basedow, after comparing his observations with those of Giles and Tietkens, came to the conclusion that this was the Mount Unapproachable of Giles and the Mount Harris of Tietkens.* On July 2 we struck a course south-west for the Petermann Range, crossing many quartz lodes which, if time had permitted, would have been well worth prospecting for gold. The Petermann Range where first struck consists of quartz schist, many quartz reefs showing. After crossing the Hull River we passed one of the most prominent and highest landmarks in this locality, named by the natives Mount Kikinguana.

Next day our two natives decided not to come farther, and no bribe would induce them to alter their decision. When a start was made after lunch they were missing. Our course now ran along a sandy valley between ranges of bare quartzite hills. The country was devoid of feed; even on large areas the desert oak had died. Across the border into West Australia it was stony, with occasional patches of stunted mallee and spinifex. During this stage we passed to the south of the Norupata and Kaltogarama Hills. Here I think we were as far removed from civilization as it would be possible to be in Australia.

Retracing our steps to the Docker Gorge, we passed through into a compound surrounded by rugged and impenetrable hills. Here the aspect changed —there was fair camel feed, buck bush, water bush, and vetch. The area would be about 10 miles by 6, intersected by many dry creeks and dotted here and there with mulga, beetwood, corkwood trees, emu bush, and other varieties of small timber. Travelling south-west till midday we found a good supply of water in a gorge coming out of the Pottoyu Hills at "Wooroorinna" waterhole. Next day we crossed to the Ruined Ramparts and tried to make a course south-east between this range and the Pottoyu Hills, but, after losing considerable time, had to abandon the project. We here discovered a deep waterhole named Weakottu. Climbing one of the highest hills near this camp we got a fine view of Lake Amadeus. Making north-east from this camp in 5 miles, mostly over very rough country, at times having to tie a tree behind the camel buggy when descending the steep hills, we passed on through a narrow and rocky defile into a valley running south-east between the Piultarana and Mannanana Ranges. On July 9 we came to a break in the Mannanana Range, the gorge of the Hull River and its dry sandy bed 80 yards wide. Passing through this gorge we found another compound bounded on the south-west

*It may be pointed out that Tietkens did not regard his Mount Harris as being identical with Giles' Mount Unapproachable ('Journal of Mr. W. H. Tietkens' Central Australian Exploring Expedn.,' Adelaide, 1890). On the map accompanying his report, he shows Mount Unapproachable as the western extremity of Long's Range (see sketch-map on p. 260 of this *Journal*), approximately 50 miles to the east of Mount Harris. Tietkens' words are: ". . . the conviction is forced upon me that the west extremity of Long's Range is his [Giles'] Mount Unapproachable, and this is verified by the bearing of Mount Olga, and from the fact that no signs of any hills or ranges are to be seen towards the south-east" (*op. cit.* p. 20). It may be, however, that Dr. Basedow may have reasons for assuming that Tietkens was in error in this identification of Mount Unapproachable.

by the Pottoyu Hills. Here, as in the country we had passed over since leaving the Ruined Ramparts, drought conditions prevailed. We saw many native tracks, and a small cave in the southern side of the gorge showed signs of having been recently occupied. In camp near here, the flies, which we had not seen so bad since leaving Charlotte Waters, were in millions. The spinifex being very dry and inflammable, we frequently when travelling set it alight as a friendly sign to the natives.

On July 11 one of the natives who had accompanied us from McNicol Range again joined the party, and we saw others, but they kept aloof. After taking bearings from Etundu Ridge we retraced our steps through the short defile of the Shaw River; this at present is a dry watercourse, and is about 90 yards wide. Four of the local natives now accompanied us. From here we had some heavy going through mallee and spinifex. At Irving Creek we found a large camp of natives, but they were disinclined to be friendly. Next morning, however, the natives who joined us at Etundu Ridge guided us to a water supply—Tortarinna Spring. By digging to the depth of about 15 inches on the bank of a dry creek quite a good supply of water is obtainable. From here two natives accompanied us to Mount McCulloch, named by the natives Nangorru. We camped at the base of this mountain, and next morning Dr. Basedow and I, with two natives carrying instruments, climbed the mountain. On reaching the top we were surprised to find a half-finished cairn about 10 feet in diameter, constructed of large stones; certainly whoever did this work must have used a crowbar to dislodge these stones. This surely was the spot where disaster overtook the George Expedition in 1906. We had a magnificent view from here over the Pottoyu Hills, and also of the hill that terminates the Petermann Range—Mount Mungoranna.

The natives told us that there was a big water on the northern side of the ridge from our camp. After circling round some hills about 6 miles and turning north-west we came to Piltadinnya water, at the base of a quartzite gorge where there was a natural reservoir and, some 20 feet higher up, two fine rock holes containing a large supply of water. The drainage of a big valley lying to the north-west is the feeder. Late in the afternoon several parties of natives arrived, one a party of old men in charge of a number of boys about to undergo a certain initiation rite. They seemed sullen, refusing to take presents, and even Artitama, who had travelled with the expedition from Etundu Ridge, came demanding tobacco. Later our doubts and fears proved to be correct, as one of our attendants informed us that there was trouble brewing; a double watch was kept during the whole of the night, the natives also watching us as we were watching them.

Leaving Piltadinnya on July 14, we shaped our course south-east for Stevenson's Peak. A few of the natives followed us for a short distance and then suddenly disappeared. Our course led us over many sandhills. Desert oaks were very numerous, also patches of stunted mallee and large areas covered with spinifex. We were fortunate when retracing our steps from Piltadinnya to find a roll of maps that had fallen out of the camel buggy on the previous day. The country to Feltham Hill was very similar to that recently passed through, with the result that our camels were now in a very weak state. To avoid going round the western side of Von Doussa Hill we passed between

it and Gordon Hill, and thus saved a considerable distance, but had a very arduous time getting the camel buggy through, and at times our task seemed hopeless. Eventually we found a pass and emerged on level country on which was some fair camel feed. After passing Feltham Hill drought conditions gave way to abundance of feed; good rains must have fallen in this locality, as the country was covered with a bloom of vetch and many varieties of everlastings, also buck bush, water bush, etc.

Arriving at Opparinna Springs, we refilled our water-drums and gave the camels a badly needed day's rest. Going north from here we rounded Abarra Hill, then running south-east, making for a pass that we thought probably would be south of McNamara Hill. On this stage we struck a terrible dust-storm, the wind veering temporarily round to north-west, and then the temperature rose to 96°. The night before we arrived at this hill we were surprised to see fire-sticks waving in the distance. It turned out to be one elderly native, two women and three children, who were peaceably inclined. In the morning they took us to a fine spring they called Orliabonna, the spring itself being surrounded by tall bulrushes. The waterhole from the main spring is about 200 yards long, and a smaller spring feeds an area 100 yards long which joins the main supply. We saw many Teal ducks on this water. One of the natives accompanied us for about an hour, but as he was carrying a boy about four years old he soon gave up.

We descended into the valley of Whittles' Creek, certainly an experience one would not wish to repeat, as masses of rock had to be avoided and dense jungles of Ti Tree cut through. Before entering this pass we got a fine view of Mount Woodroffe, the highest point of the Musgrave Ranges, 5200 feet. From here to Glen Ferdinand the going was good and giant salt bush grows in profusion. Going through Glen Ferdinand, we were joined by two natives, who were hunting. They showed us a very good rock hole containing water, and accompanied us to Ernabella Spring. It is still possible to locate trees marked at this spot by Ernest Giles, Carruthers' party, R. T. Maurice, and Gosse. Dr. Basedow took photographs of these; in a few years the ravages of white ants will have made them unrecognizable. From Ernabella a straight course was made for Oodnadatta, 220 miles east-south-east. Travelling via Warrunguddinna waterhole and Todmorden Station, the expedition disbanded at Oodnadatta, the European members leaving for Adelaide by train on August 17.

I cannot conclude without expressing my hearty appreciation of the important and valuable assistance rendered to the expedition by Dr. Basedow, not only from a scientific point of view but also in enabling the expedition to establish more or less friendly relations with some of the notoriously hostile tribes. Being able to speak the Aluridja dialect, he not only gained the confidence of many of the natives, but also obtained from them their names for mountains and other features which now appear on the map.

GEOLOGICAL REPORT ON THE PETERMANN RANGES, CENTRAL AUSTRALIA

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When one approaches the area of the Petermann Ranges Goldfields from the east, a marked change in the geological formations meets the eye. Whereas in the Mount Olga–Mount Currie series the beds consist essentially of metamorphic conglomerates of Ordovician Age, striking north 10° east, the Petermann Ranges are composed wholly of Cambrian (or Pre-Cambrian) quartzites striking north-west. The latter beds have been lifted to considerable altitudes (3000 feet above sea-level) by massive igneous rocks consisting largely of porphyritic granite. The granite is further intruded by dykes of diorite and dolerite which are commonly referred to as greenstone. In consequence of their upheaval, the quartzites have been folded and dip at high angles on either side of the igneous core. During this process the beds have been grossly shattered, so that at the present day they present the characteristic feature of the region, viz. steeply scarped caps of quartzite resting upon granitic bases. The quartzite is a bluish or pinkish white, waxy stone, of very fine grain and sub-conchoidal fracture. On its weathered surfaces a glossy film of ironstone, the so-called patina or desert-varnish, has imparted to it a distinctive reddish colour.

Along the junction of the quartzite with the granite, quartz schist occurs which is highly fissible and weathers into slaty slabs. Near the greenstone, moreover, the siliceous rocks have locally altered to hornstone. Both the metamorphic rock and the intrusives contain very numerous quartz lodes, most of which are secondary, that is to say, the product of infiltratory processes subsequent to the intrusion of the quartzite by the igneous magma. Here and there the siliceous lode-matter is intimately mixed with mica and approaches more the type of a pegmatitic vein.

The lodes trend north-west, north-east, and north and south, and consist of white to clear quartz, mixed with ironstone, manganese oxide, and ferruginous chert. The stone is compact to cellular, and contains numerous cavities and small vughs whose surfaces are covered with drusy quartz and chalcedony. The lodes cut the country rock most regularly and in parallel systems. At one locality, for instance, 7 miles south-west of Mount Harris, no fewer than twelve parallel lodes cut the gneissic beds of which the country is there composed, the largest measuring up to 20 feet in width. South-westwards from this point, towards the main axis of the Petermann Ranges, a great succession of parallel reefs was encountered by the expedition ; the plains for many miles in every direction are covered with quartz and ironstone which has been shed by the decomposing lodes.

I have no hesitation in stating that this tract of country has all the appearances of an auriferous belt. In all my experience I have never seen any tract of virgin ground so promising, or any proved ground so clearly defined on the surface. Unfortunately, my duties in connection with the Mackay Exploring Expedition and the uncertainty of finding water in the new country ahead would not allow me to undertake any prospecting operations. My geological observations, however, convinced me of the fact that this was an area of exceptionally great possibilities as a goldfield. The lodes occur under conditions which are regarded as most favourable by all practical gold miners; and I strongly recommend that a thorough and systematic test be made.

Should the results of such investigations prove successful the enormous extent of the likely area might readily suggest that here lies a tract of rich auriferous country which might be destined to become the greatest yet discovered in Australia.

THE OPINION OF COLUMBUS CONCERNING CUBA AND THE "INDIES"

CECIL JANE

IN the original demands of Columbus (Navarrete, 'Colección de los Viages,' 2, p. 7), he asks that he may be appointed viceroy and governor-general "en todas las dichas islas y tierras-firme, que . . . él descubriere *ó* ganare en las dichas mares."

In the actual agreement (Navarrete, 2, p. 9) he is given the appointment of viceroy and governor-general "de las dichas Islas, é Tierra-firme, que asi descubriéredes *é* ganáredes."

The change from "ó" to "é" seems to be interesting. A possible explanation is perhaps as follows:

1. Columbus was not sure whether he would or would not reach Asia, and to safeguard himself asked to be appointed viceroy and governor-general of such lands as he might discover *or* gain. If he reached Asia, it might well be that he could hardly be said to have discovered, *e.g.* Cipango: if he were to reach the land of the Great Khan, he might not be able to "gain" it, in the sense of conquering it.

2. Ferdinand and Isabella, so Las Casas tells us, were very unwilling to grant demands which seemed to be so extravagant as those of Columbus. But they felt sure that the only land which he could reach would be Asia, and hence they made the change from "or" to "and." They believed that in this way they were only granting Columbus the position of viceroy and governor-general over some relatively unimportant islands which might lie between Spain and Asia. It would always be possible for them to contend that the grant did not imply any authority over Asiatic territory which could be regarded as having been already discovered prior to the voyage of Columbus or which he would at least not "gain."

3. Columbus agreed to the alteration, because he felt certain that he would certainly discover and gain lands important enough to constitute an adequate reward, whether or not he eventually reached Asia.

In short, both parties felt that they had got the better of the other, and the subsequent treatment of Columbus by Ferdinand and Isabella can be partly explained by the fact that the sovereigns felt that Columbus had more or less swindled them into making a grant which they had no intention of making.

If this explanation be correct, the conclusion is that Columbus thought it probable that he would reach Asia, but was even more certain that between Spain and Asia there lay lands of considerable extent. It may be suggested further that it was his knowledge that Ferdinand and Isabella were convinced that he was attempting to reach Asia on his first voyage, that led Columbus to assert explicitly in his letter to Santangel that he had reached the Indies. It was really another way of saying that he had done that which he had set out to do, and does not necessarily imply that he himself believed that he had reached the Indies as already more or less known.

In this connection it is often asserted that Columbus identified Cuba with the mainland of Asia, and leaving aside the more indirect evidence which may be drawn from contemporary maps, the basis of this assertion is found in a

document drawn up, under instructions from the Admiral, by Fernán Perez de Luna, a notary of Isabela in Española (Navarrete, No. 76, vol. 2, 143–9). On the strength of this document Columbus is said to have compelled the crews of his ships to swear that they believed Cuba to be "tierra firme," and to have threatened with severe punishment any of these sailors who might afterwards express a contrary opinion. Neither of these statements is strictly accurate. The crews were ostensibly at least only asked to give an opinion on the question whether Cuba was the mainland. The penalties threatened were not to be inflicted upon those who thought it to be an island, but upon those who having expressed one view under oath might afterwards contradict that view. The document, indeed, perhaps deserves more careful attention than it has generally received.

Briefly analyzed, this document, which is dated 12 June 1494, states that Columbus left Isabela with three caravels, "por venir á descubrir la tierra-firme de las Indias." He had, as yet, no certain information concerning Cuba, as he placed no reliance upon the declarations of such natives as he had been able to question. He now sailed for 335 leagues along the coast, after which he became convinced that it must be the mainland, "por la fechura é la noticia que de ella tenia, y el nombre de las Provincias, en especial la provincia de Mango." This conviction was shared by the "Maestros de cartas de marear y muy buenos Pilotos" who were with him, and was strengthened by the statement of natives that the land extended westwards for twenty days' journey and that "ni sabian si allí hacia fin." Having proceeded still further four days' journey along the coast, "todos fuesen muy ciertos que era tierra firme," and attributed the contrary assertions of some natives to their ignorance: "porque en todas estas islas é tierras no hay puebla á la mar, salvo gente desnuda que se vive de pescado, y nunca van en la tierra adentro, ni saben que sea el mundo, ni dél cuatro leguas lejos de sus casas, y creen que no hay en el mundo salvo islas, y son gente que no tienen ley ni seta alguna, salvo nacer y morir, ni tienen ninguna polecia porque pueden saber del mundo."

Being anxious that, when the voyage was over, the discoveries made should not be decried "con malicias," Columbus instructed Perez de Luna to collect the sworn opinions of all the crews on the question whether they believed Cuba to be the mainland or an island. If any doubted that it was the mainland, Columbus would "luego les quitaria la dubda, y les faria ver que esto es cierto y qués la tierra firme." Each individual was informed that the Admiral "les puse pena de diez mil maravedis por cada vez que lo que dijere cada uno que despues en ningun tiempo el contrario dijese de lo que agora diria, é cortada la lengua; y si fuere Grumete ó persona de tal suerte, que le daria ciento azotes y le cortarian la lengua." In answer to the interrogatory addressed to them, each one replied on oath, "que . . . no oyó ni vido isla que pudiese tener trescientos é treinta é cinco leguas en una costa de Poniente á Levante, y aun no acabada de andar; y que veia agora que la tierra tornaba al Sur Suduest y al Suduest y Oeste, y que ciertamente no tenia dubda alguna que fuere la tierra-firme, y que antes de muchas leguas, navegando por la dicha costa, se fallaria tierra adonde tratan gente politica de saber."

The document was duly executed and on the death of Perez de Luna was found among his papers at Isabela by Diego de Peñalosa, "escribano de cámara

del rey é de la reina," who had been instructed by Columbus to go through them. It was formally certified by Peñalosa, 14 January 1495, as having been found among the documents left by the deceased notary.

From this document it would appear that on 12 June 1494 Columbus at least professedly believed that Cuba was the mainland. In his extant writings, however, the Admiral nowhere expresses such a belief. In the letter to Santangel, he says that he is uncertain on the matter,* and in the Journal, as preserved by Las Casas, he notes that Pinzón thought that Cuba must be a continent.† Upon all other occasions he expressly describes it as an island. It is true that Las Casas, in his narrative of the third voyage—a narrative professedly derived from the papers of the Admiral—twice states that Columbus believed Cuba to be "tierra firme." He speaks of the illness contracted by Columbus "en el descubrimiento de la tierra firme de las Indias, conviene a saber de Cuba, que tuvo siempre, como no la pudo rodear, aun hasta agora, por tierra firme,"‡ and elsewhere he says that, at the time of the discovery of Paria, Columbus was more worn out than he had been "cuando descubrió la otra tierra firme, que es la isla de Cuba."§ But too much weight should not be attached to these passages. In neither does Las Casas claim to be quoting the words of Columbus; the most that he does claim is that his remarks are a deduction from the papers left by the Admiral. He was not too careful in his use of his materials; he may not, and probably did not, have those materials actually before him when he was writing his 'History.'‖ Upon another occasion, also, Las Casas states that Ferdinand and Isabella were especially anxious that Cuba should be explored, "que hasta entonces fué estimada por tierra firme,"¶ and when this passage is read in its context, it becomes clear that Las Casas meant by "hasta entonces" prior to the voyage of exploration undertaken by Columbus from Española in 1494. In his account of that voyage, he says that Columbus became convinced that Cuba was an island, since a native "le certificó que Cuba era isla que la mar cercaba."** Ferdinand Columbus bears out Las Casas, saying that a native "disse al' Ammiraglio per cosa certa, che Cuba era isola."†† A passage in Bernáldez is still more significant: "la Juana, que él (*sc.* Columbus) juzgava por isla, y es tierra firme, fin y cavo de las Indias por el oriente, . . . y así se lo dixe y hice entender yo el año de 1496, quando bino en Castilla la primera bez después de aver ido á descubrir, que fué mi guésped, é me dejó algunas de sus escrituras, en presencia del señor don Juan de Fonseca."‡‡ The honesty of Bernáldez is beyond question, and therefore, unless he wholly misunderstood Columbus or unless his memory played him false, it is certain that in 1496 he discussed

*Major, 'Select Letters of Columbus,' p. 2.

†*Journal*, October 30 (ed. Markham, p. 63).

‡Las Casas, 'Historia de las Indias,' 1, 130 (ed. Reparaz, 1, p. 516).

§Las Casas, 1, 138 (1, p. 543).

‖See "Las Casas as an Historian," *Times Literary Supplement*, 15 March 1928.

¶Las Casas, 1, 94 (1, 396).

**Las Casas, 1, 95 (1, p. 396). For what it is worth, it may be noted that Las Casas always uses the verb "certificar" in the strongest sense of the word.

††Ferdinand Columbus, Vita, c. lvi (ed. 1867, p. 169).

‡‡Bernáldez, 'Historia de los Reyes Católicos,' c. 123 (ed. 1869, 2, p. 42), printed in Lollis, 'Scritti di Colombo, Raccolta,' 1, i, p. 239, col. 2.

with Columbus the question whether Cuba was or was not an island, that he held, in opposition to the Admiral, that it was the mainland, and, as he says with his usual charming simplicity, "made him understand" that he was in error. That Columbus was actually convinced by the arguments adduced by Bernáldez—the essence of which he gives—is about as improbable a supposition as could be made, and it may accordingly be asserted that, whatever may have been his opinion in 1494, in 1496 Columbus was convinced that Cuba was not the mainland. Had he even been doubtful on the matter it is unlikely that he would have denied that it was the continent in the presence of Juan de Fonseca of all people, in the presence, that is, of a man whom Columbus rightly or wrongly believed to be eager to minimize all his achievements.

In the interval between his return to Española from his voyage of exploration in 1494 and his visit to Spain in 1496, Columbus did not return to Cuba, and there is no suggestion that any exploration of that island was undertaken by any one else during that period. The opinion which the Admiral gave to Bernáldez must therefore have been based upon something which he learned when he was on the Cuban coast in 1494 or upon the results of discussion in Española of the information then acquired. In the complete absence of any evidence of such a discussion, it is perhaps not extravagant to assume that the statement of the native of Cuba did carry conviction to Columbus, as Las Casas and Ferdinand Columbus say that it did.

The exact day on which the native "definitely assured" Columbus that Cuba was an island is not recorded, but when such dates as are given are examined, it becomes clear that the incident cannot have occurred later than 13 June 1494, the day on which the Admiral set out on his return journey to Española. It is probable enough that the incident occurred on or before 12 June 1494, that is, on or before the date on which the document drawn up by Perez de Luna was witnessed and signed. It thus is also obviously probable that this document was not in accord with the information possessed by Columbus at the moment of its completion; it is hardly possible that it should have been so in accord when it was signed, but that almost before the ink on it was dry, the truth about Cuba should have become known to the Admiral. In such circumstances it may seem to be curious that the document should ever have been signed at all.

It is, of course, possible that Columbus did not believe the native who told him that Cuba was an island, but regarded him as being only one more of those who were so ignorant that they could conceive of nothing but "islands." To such an explanation, however, there is the objection of the terms in which Las Casas and Ferdinand Columbus describe the incident, in addition to the positive assertion of Bernáldez and the fact that Columbus himself does not call Cuba "tierra firme." It is also possible that the document is a forgery; that it was prepared by Perez de Luna or by Diego de Peñalosa without the knowledge of the Admiral. This would, however, involve the supposition of a general conspiracy, since the names of the witnesses and of those who swore are all duly recorded. Nothing is known of the personal attitude of either Perez de Luna or Peñalosa towards Columbus, and there is no reason to suppose that they were his implacable enemies or that either of them was his enemy, as would have necessarily to be the case if the document were

forged. It is a further possibility that Columbus, during his stay with Bernáldez and because Juan de Fonseca was present, was playing a definite game. Knowing or thinking that Fonseca was hostile to him, he may have deliberately belittled his achievements, leaving his friend Bernáldez, in all innocence, to insist that he had discovered more than he claimed to have discovered. In this way he might be supposed to be likely to gain some reputation for modesty—and Fonseca seems to have objected to the vanity of the Admiral*—and also to have safeguarded himself if, after all, Cuba should prove not to be the mainland. But if this be the true explanation, it was the only occasion on which Columbus made little of that which he had done, and the only occasion on which he displayed such tactful ingenuity.

A far more probable explanation is that Columbus, at the moment when he issued his instructions to Perez de Luna, honestly believed that Cuba was the mainland; that, during the time occupied in collecting the evidence and the oaths of the crews, he learned that his belief was false, but that he none the less allowed the preparation of the document to go forward and allowed it also to be completed. For so doing he may have had one or both of two reasons. He may still have hoped—and he was always an optimist—that Cuba would after all prove to be the continent, although he felt sure that it was not. He may have wished to guard against the hostility with which his men regarded him or with which he feared that they regarded him. It must be remembered that before he left Española Columbus had been faced with serious disaffection on the part of the Spaniards, illustrated by the "plot" of Bernal de Pisa and by the conduct of Firmin Zedo, who had decried the wealth of the island. Such disaffection would clearly be heightened by the report of failure on the voyage of exploration to discover anything more than some more islands. Columbus may well have wished to prevent his crews from reporting unfavourably: that he was so anxious is suggested in the document itself, and he therefore may have availed himself of the impression which the extent of Cuba had made upon his men to induce them to bind themselves not to belittle its discovery on his return. He could easily salve his conscience on the matter by the reflection that the island had not been circumnavigated; that task was only completed some years later under the auspices of Nicolas de Ovando. Columbus intended himself to carry out further investigations, but was prevented by events in Española. The document, drawn up by Perez de Luna, thus assumes the character of a precautionary measure; the oaths of the crews were to be held *in terrorem* over them, to prevent them from supplying additional material to those who were already declaring that Columbus had grossly deceived the king and queen for his own gain.

Its interest lies not in that it throws light upon the geographical ideas of Columbus, but that it illustrates the character of the relations which prevailed between him and the Spaniards.

*So much may be gathered from a letter of Ferdinand and Isabella to Fonseca, 4 August 1493 ('Documentos Inéditos relativos al descubrimiento . . .' (I^{a} serie), 30, pp. 184–188).

JOURNEYS IN CENTRAL ARABIA

ARABIA OF THE WAHHABIS. By H. St. J. Philby, C.I.E., I.C.S. (Retd.). *London: Constable & Co.* 1928. 9 × 6 *inches;* xiv + 396 *pages; illustrations and map.* 31*s* 6*d*

THIS is a continuation of 'The Heart of Arabia,' and as eight years have elapsed since the latter work was written it may be well to refresh our memories with a brief *résumé* of the circumstances in which Mr. Philby embarked upon the year's wanderings in Central Arabia, of which the present volume completes the record.

Early in 1914 Ibn Sa'ud had succeeded, by a bold and sudden effort, in wresting the control of the Hasa province from the Turks and expelling them bag and baggage from his territory; it seemed natural therefore to expect that, on the outbreak of the world war a few months later, both his mood and his circumstances would dispose him to a policy of cooperation with the Allies. In that belief, on the firing of the first shot in the Mesopotamian campaign at Fao, Captain W. H. I. Shakespear, who as the Government of India's representative at Kuwait had established very cordial personal relations with the Ruler of Nejd, was deputed to the latter's headquarters with instructions to induce our friend if possible to move up immediately towards our left flank in order to give us support in the establishment of our position at Basra. Not fully seized of the imminence of war in 'Iraq, Ibn Sa'ud proved to be absorbed at the moment in his own schemes of conquest, and when Captain Shakespear came up with him, his tribal contingents were already mobilized, and he was on the point of attacking his hereditary enemy, Ibn Rashid of Jebel Shammar. Success in that direction would also have been useful to us at the time, but in the collision which took place a few days later and in which, most tragically, Captain Shakespear lost his life, the forces of Ibn Sa'ud, if not actually defeated, recoiled from the shock so badly crippled that it became clear that no effective cooperation could be expected from them for a long time to come: and so, to use Mr. Philby's words, "King Hussein stepped into the breach."

It was not until three years later, in the autumn of 1917, our expeditionary force being then firmly established in Baghdad, that it seemed that Ibn Sa'ud might now be able to assist us materially by making another attempt to eliminate Ibn Rashid, who was still active in enemy interests. It was accordingly decided to send Mr. Philby at the head of a small mission to Riyadh, with the object of urging this on Ibn Sa'ud and reporting to headquarters on the possibility of its successful execution. It may be mentioned that at this period and to the end of the War that potentate was in receipt of a war-subsidy of £60,000 per annum for such measure of cooperation as he might be able to give, his good-will being above suspicion and his assured friendship being in any case a valuable asset to us.

Travelling via Bahrein and Hasa, the members of the mission reached the Wahhabi capital at the end of November hoping to meet there representatives of the High Commissioner of Egypt and the Sharif. The two latter however failed to arrive, difficulties having been put in the way of their overland journey. Accordingly Mr. Philby, nothing loth, bethought him of crossing to the Hejaz to escort them back, and obtained Ibn Sa'ud's consent to the proposal. Arrived safely at Taif after an interesting trek, he found the Sharif obstinately opposed to the return of any party overland, and had no alternative but to proceed to Cairo and thence back to Basra by sea. On arrival there on 24 March 1918 he lost no time in setting out again, via Zubair, for Riyadh, which he reached without incident on 11 April 1918. He now found his host preoccupied with the disturbing situation which existed both on his western frontier, where the attitude of the

Sharif was menacing, and also on his right flank, where the Ajman tribe were giving him trouble; he had little stomach therefore at the moment for an expedition northwards against Ibn Rashid. However, after several earnest communions Mr. Philby succeeded in bringing him to a definite assurance that he would really take the field early in Ramdhan, *i.e.* about the second week in June. In the interval he agreed to our representative making a short expedition to the Wadi Dawasir and back, and Mr. Philby started thither on May 6, returning to the capital on June 24, after a very successful trip. His experiences up to this point were recounted in two papers read before this Society, and later in 'The Heart of Arabia.' Now, in his 'Arabia of the Wahhabis,' he carries the narrative of his sojourn to its conclusion. It is the story of his last four months in the country, during which he accompanied Ibn Sa'ud on his march to Qasim, whence the long-delayed campaign against Ibn Rashid was to be launched. Launched indeed it was and with some measure of success, but before the victory could be followed up the progress of the Syrian campaign altered the situation; Ibn Sa'ud was discouraged from pursuing it, and Mr. Philby returned disappointed to Baghdad.

Though several of his predecessors had passed from Riyadh to Washm and Qasim, and from Qasim to Kuwait (except for the section Mashquq–Tarafiya) he let no opportunity slip for diverging here and there from the ordinary track, and the copious notes which he kept throughout not only supplemented the recent reports of Leachman and Shakespear, but also provided a considerable amount of new detail in time for incorporation in the "Riyadh" sheet of the existing 1/M map. While therefore it may perhaps be said that the geographical importance of his earlier journeys to the Hejaz and the Wadi Dawasir does not attach in the same degree to the expeditions of which he now writes, it was by no means lacking. For the rest, the present volume—if we disregard a few trivial blemishes evidently resulting from the author's absence in the Hejaz during its passage through the press, and the occasional infliction on his reader of some strange word like "prosternation," which sends one running to the Oxford dictionary—is of the same high quality as its two predecessors. Like them it abounds in valuable and interesting details of the most varied kind, which not only bear tribute to his great and versatile industry, often displayed in the most trying circumstances, but provide a copious store of information for all who follow in his footsteps. He, and his readers, are indeed fortunate in the fact that such a rare chance of extended travel in Arabia of the Wahhabis, under comparatively privileged and auspicious conditions, should have befallen him when it did. He was just in time, the scene of his narrative being still the Arabia of his great precursors whose names are writ so large and yet so rarely on her scroll of fame; but the parting of the ways was surely close at hand, and even the few short years which have elapsed since our author's travels were undertaken have witnessed epoch-making developments. As he writes in his preface, "It was, maybe, the operations of Lawrence in the north that roused the Arabs from their long sleep, to take part, as a giant refreshed, in the race of the modern world. But whatever the cause, it were well to recognize that the canons by which formerly we were wont to judge Arabian events and tendencies are no longer applicable."

Though incidentally he contrived throughout his sojourn to render a good deal of service to geography Mr. Philby's mission was primarily a political one, so politics naturally figure prominently in his pages; and here we are not on easy ground. One who has himself ploughed the long and lonely political furrow can well realize the trying circumstances in which our author was placed—often cut off for weeks, and at such a critical time for his own country, from all news of

the outside world, a lone though fearless Nazarene in a land of ignorant fanatics, who, as he tells us, by studied aversion and often by the unconcealed expression of their fanatical hatred made his life a lonely and depressing one. Added to that was clearly the feeling that he was not receiving all the attention and support which he had a right to expect, from the powers that be. Placed as he was, he was perhaps apt to forget that our Mesopotamian venture was but part of a colossal life-and-death (and often hand-to-mouth) struggle, and that we had perforce to turn to those who could best "deliver the goods." Mr. Philby's own pages make it sufficiently clear that with the best will in the world Ibn Sa'ud was unable to make delivery, and as the result of his lack of achievement others stepped into the breach and with more material success. In touching on this aspect of Mr. Philby's book it is difficult to pass over in silence the lively aspersions which he is prone to cast upon the policy and even the good faith of the Government which he served and its regional authorities, whether at Baghdad or Cairo. That in the anxious position in which he was placed his outlook should have been obscured to some extent by the heated atmosphere of his immediate surroundings was not unnatural; but one would fain have hoped that in the mellow retrospect of eight years the other side of the question would have appeared clearer and have prompted him to temper his criticisms. But let us dwell rather on the secular details of his travels and enjoy the varied fare with which he provides us. His return from the south found the capital in the throes of a midsummer Ramdhan, and he gives us a valuable account of the daily lives of its puritan population during that trying ordeal. A propos of it he put a poser to his host to which no satisfactory reply was forthcoming. "How," he asked, "would you keep Ramdhan if you were at the North Pole, where at this season the sun never sets?" He tarried patiently in the capital through Ramdhan and for a month afterwards while Ibn Sa'ud made his leisurely preparations for the promised campaign, and during that time, though all reasonable arrangements were made for his bodily comfort, as the honoured guest of the Imam, whose personal friendship he lost no opportunity of cultivating, the craven fear of public opinion deterred most of his friends from openly inviting him to their houses, and he could move abroad but little. It was therefore with a great feeling of relief that on August 5, Ibn Sa'ud being at last ready for the war-path, he was able to shake the dust of Riyadh off his feet and once more take to the free life of the desert.

The Sultan's objective was now Northern Qasim, via Washm (Shaqra), Anaiza, and Buraida; the routes followed are embodied in the War Office 1/1,000,000 Map of 1927, of which a section accompanies his volume, but the scale being so small many of the smaller places included in Mr. Philby's détours and touched upon in the narrative necessarily do not appear. Some supplementary regional sketches would have made his precise itinerary easier to follow. Shaqra had been notified as the rendezvous for the contingents called up for the campaign, and reaching there on August 15 Ibn Sa'ud took counsel with his leaders, explaining to them his proposals and his plan of campaign. Shaikh Faisal Ibn Duwish, the Umtairi firebrand from the Artawiyeh settlement, who has since figured so prominently in 'Iraq–Nejd politics, acted as spokesman of the assembled warriors, and though expressing complete readiness to attack the Sharif or the Ajman they displayed not the least inclination to try conclusions with Ibn Rashid. However, having prevailed upon the Wahhabi priesthood to support him in a declaration that the Shammar Chief was the arch enemy for the moment, Ibn Sa'ud was able to win over his leaders to that idea; but, alas! it turned out that there was to be no immediate advance, and much to our author's chagrin the contingents were dismissed to their homes with instruc-

tions to reassemble at Buraida a month later. In the meanwhile, after a sojourn of six days at the Washm capital, during which Mr. Philby had ample opportunity for studying the town and neighbourhood, and gives a full account of them, Ibn Sa'ud and his retinue moved slowly northwards, reaching Anaiza on August 23.

On the way thither Mr. Philby made a point of exploring the great salt-pan known as Mamlaha Aushaziya, of which he gives a photograph and writes:

"Its northern extremity receives the spill of a branch of the great Wadi Rima itself, and it thus forms a self-contained basin having the appearance of a vast frozen lake covered with snow. In fact it consists of a solid block of pure white salt, hard and firm, overlying to a depth of a foot or eighteen inches an undersoil of black slime which after floods becomes treacherous to those who walk upon it unwarily. The people of Sirr, Mudhnib and Aushaziya have a prescriptive right to take as much as they please without payment."

For Anaiza he has, like his predecessors, nothing but praise. The complete freedom of its inhabitants from any kind of bigotry and their open-handed hospitality at first almost bewildered him, and it is clear that the memories of his two sojourns in that delightful atmosphere, in such marked contrast as it was to that of the sister town Buraida, are among the happiest of his travels. Incidentally, it was an added interest to hear tell of his predecessors at Anaiza, of Doughty, Huber, Leachman, Raunkiaer, and Shakespear; especially of "Khalil," of whom there was a definite and kindly tradition, which, in the passage of time, would explain his temporary expulsion by the fact that his coming coincided with a small-pox epidemic and that Amir Zamil's hand was forced by the priesthood, who found it convenient to attribute it to the presence of the infidel. Interesting light is thrown on this episode in the recently published 'Life of Charles Doughty' by our late lamented President.

Though he was destined to return very shortly, on this occasion Mr. Philby spent only two days in Anaiza, and on August 26 passed on with Ibn Sa'ud to Buraida, 15 miles distant. Buraida had in no wise changed its spots. "You may travel where you will," he writes, "with a native of Buraida in perfect friendliness and friendship, but the moment you enter the gates of the city the friendship is at an end until your sojourn is done." There seems to be some evil spirit pervading the atmosphere of the latter town, of which one traveller after another has recorded his bitter experience. The suggested explanation that the inhabitants of Anaiza are more commercial and consequently more travelled and cosmopolitan than their neighbours of Buraida, whose tastes lie rather in the ownership of camels and the maintenance of the desert caravan-traffic, seems hardly sufficient to account for such an entire difference of atmosphere in two towns only 16 miles apart and in free communication. Even 7 or 8 miles distant, at Busar, Mr. Philby found a most friendly spirit and a complete absence of fanaticism. As he says, it is a problem of psychology of which there is no apparent solution. During the three weeks which he spent in the inhospitable city on this occasion he was able to carry out a good deal of quiet topographical research and to draw up an up-to-date plan of the town to scale, as well as a considered estimate of the population, which he puts at 20,000, as compared to 15,000 at Anaiza. Leachman, on the other hand, gave it only 10,000, but was in a less favourable position for obtaining a just estimation.

At last, on September 9, the war standard was hoisted and Ibn Sa'ud made a move out of Buraida bound for Tarafiya and Qusaiba. And now, no doubt mindful of the tragic fate of his friend Shakespear in very similar circumstances (as well as for other reasons explained in the text), he set his face altogether against his guest accompanying him any farther, insisting on his remaining

patiently at Buraida or Anaiza until he should receive news from the front of a successful issue. After nursing his disappointment for a couple of days Mr. Philby elected to return to his hospitable friends at the latter town, and set out there by a different route to that of his coming. It was on this short détour that he passed through Busar, above mentioned, and the other small hamlets in the "khubub" or depressions in the Nafud. The narrative of his daily life at Anaiza during the fortnight which he was now to spend there forms perhaps the most interesting chapter of his book, and when the time came to take leave of his friends there he did so with genuine regret.

The first news that reached him from the front told of a preliminary concentration at Tarafiya followed by a final assembly of the clans at Qusaiba, where a force of 5000 men, the greatest number that could in practice be maintained in the field, were now gathered. Then, on September 23, came news of a "victory," accompanied by an invitation to Mr. Philby to return to the front, which he made all haste to do. Leaving Anaiza the same evening he made Buraida about midnight, and pushing on with a rising moon and travelling all the next day he reached Ibn Saud's camp at Mashquq, 4 miles east of Qusaiba, tired and stiff after twenty-four hours' hard going. On this rapid ride he had little opportunity of diverging from the straight route, and passed slightly to the eastward of those taken by Huber in 1880 and 1884, and Leachman (coming from the north) in 1912. He thus missed Ayun, which he regretted, but was able to take note of another extensive "mamlaha" or salt pan at Shiqqa. Dead to the world on arrival, he realized on waking that he was now indeed "among the host of the Lord"—Akhwan in every direction—and incidentally he was now to encounter not a little of their bigoted contumely. As regards the campaign and the reported victory, he learnt that, leaving the bulk of his army in Hail, Ibn Rashid had himself proceeded to a redoubtable stronghold four or five hours north-east of his capital, there to watch developments. Meanwhile Ibn Sa'ud, keeping a considerable force of Akhwan in reserve, had launched his main body against the Beni Yahraf, a shepherd tribe in charge of the flocks and herds of Ibn Rashid. They were attacked near Sufaila and defeated with great loss, 2000 or more camels and innumerable sheep falling into the hands of the Akhwan. Question had then arisen as to whether the success should be immediately followed up or not, and a council of war having been convened, it at once became clear that the Akhwan warriors, now glutted with their booty and busy with the distribution thereof, were in no mood for the sterner business of an assault on Hail, and a decision was taken against it. "Thus," writes Mr. Philby, "was the initiative tamely surrendered to Ibn Rashid, and, as events were yet to prove, the great opportunity of eliminating the Shammar power from the scheme of things Arabian was thrown away, not to recur until 1921." A victim of circumstances, Ibn Sa'ud, having issued orders for a fresh muster of all his contingents, decided to return to Buraida to await its development, and next day the cavalcade started southwards, reaching Tarafiya on the morrow. On this portion of the route the traveller was covering new ground and, about halfway between Mashquq and the Tarafiyah basin, he crossed the route taken by Shakespear on his long trek between Qasim and Jauf in 1914. At Tarafiya, famous in Nejd history for more than one great battle, he was content to halt for a day, reaching Buraida on October 2. Here a bitter disappointment awaited him, in the shape of a communication from Baghdad informing him that it was no longer desired by His Majesty's Government that Ibn Sa'ud should pursue his operations against Hail, lest prejudice should result to the successful campaign in progress on the Palestine front with Arab cooperation. Feeling his position keenly he decided that there was nothing to be done but return to

Baghdad and lay his views before higher authority; accordingly, after bidding farewell to Ibn Sa'ud with a heavy heart, he left for Kuwait on October 4, travelling by the usual route through Zilfi. But here again by making slight detours whenever possible he was able to fill in not a few blank spaces between the routes of previous travellers, particularly in the tract between Dijani and Al Hafar. In the course of one of these divergences an errant guide all but landed him in the hornets' nest of Artawiya, the great Akhwan settlement. The mistake was discovered just in time and the traveller sheered off to the right, contenting himself with a distant view of the settlement with his field-glasses. He reached Kuwait on October 16, where he was greeted with the glad tidings that Bulgaria had made unconditional surrender and that Beirut and Damascus were in Allenby's hands. In the two days which he spent at Kuwait waiting to take ship to Basra he saw a good deal of him whom he had regarded as one of the villains of the piece, Shaikh Salim bin Mubarak, and seems to have been more favourably impressed by him than he expected. On October 18 he sailed for Basra, and thus brought to a conclusion a memorable year of travel during which he had traversed Arabia, east and west from Bahrein to Jidda, and north and south from Wadi Dawasir to Qasim.

In bidding him farewell we may indeed congratulate him on his achievement, and venture the hope that ere long a recurrence of "Wanderlust" may send him straying towards Jebel Shammar or the Rub' al Khali. P. Z. C.

A SAGA OF THE CARAVANS

THE DESERT ROAD TO TURKESTAN. By OWEN LATTIMORE. *London: Methuen* 1928. 9×6 *inches;* xiv+332 *pages; illustrations and maps.* 21*s*

MR. OWEN LATTIMORE in 1926 was hypnotized by the great nomad's-land lying between China and Siberia, even as forty years ago Lieutenant Francis Younghusband, looking westwards from Peking, set his heart on a trans-continental journey from Cathay to Hindustan. Both were doing their first journeys, both were suffering from an "urge" which nothing but achievement would sate; and both would have suffered anything rather than turn back, or fail in their undertakings! Sir Francis made a new crossing of the Great Gobi (new in 1887 and not followed since), went down into Chinese Turkestan, and attempted to climb over into India by a new pass. Forty years have elapsed and another young traveller turns up, actuated by the same desire, his eye on the same trans-continental journey.

As luck would have it for Mr. Lattimore and for us, there was trouble on the frontier, Russia, Mongolia, and China being embroiled. In 1926 political conditions in Northern Mongolia caused all caravan traffic to keep well away from the disturbed area, "it was imperative to open a new road to Chinese Turkestan. It had to fulfil two conditions: to keep as far as possible from Chinese officials collecting transit taxes, and far enough away from the independent Mongol tribes to escape confiscation. Such a road the caravans found, and called it the Jao Lu, or Winding Road. It stands in part for what must have been an ancient trade-route through Alashan between Eastern Inner Mongolia and Khara-Khoto or the Etsin Gol, when Khara-Khoto was a city of the Tangut Kingdom. From Etsin Gol it crosses the Black Gobi and goes on through No Man's Land, touching mountains that must be a southern extension of the Aji Bogdo, which themselves extend southward from the Altai. Then there comes a day when, from a certain lonely marsh, the mountains of perpetual snow can be seen, the outliers of the T'ien Shan."

Thus it chanced that the Younghusband route was superseded by the "Winding Road" through the sands and tamarisk of the heart of the Gobi, and Mr. Lattimore, on reaching Tai-ling Miao, found his caravaneers heading for "the most desert of all the caravan routes which traverse Mongolia"—in short, he was to make a bee-line from the great northern bend of the Yellow River to Barkul, the first oasis in Zungaria under the northern slopes of the Celestial Mountains.

The author belonged to no mission or expedition. He went as a Caravan man in a World of Caravans, and herein lies the chief interest of his story. He lays open to us the weird existence led by that curious caravan community which seems to be destined to wander for ever to and fro across the desert heart of Asia. His very efficient knowledge of the Chinese language enabled him to avoid the pitfalls and inaccuracies of interpretations, and gave him unusual facilities for recording the life and traditions of the caravan class—not an unimportant fraternity of Inner Asian Society, where thousands of miles separate the rail-heads of Russia and Cathay. "I was thrown among men where talk was for ever of the prices of wool and camels, of caravan routes and cart-hire, of journeys counted in many tens of days into the remote hinterland of Asia, and of the bandits besetting this road or the soldiers obstructing that. Or else their gossip would run on storms or the loss of caravans, or lucky ventures that had made men rich at a blow, and all the chances and alarms of a way of trading and living utterly different from the alien civilization which I had seen creeping up along the railway."

Some of his descriptions are vivid word pictures. "We overtook a Barkul caravan on its way home, and were ourselves overtaken by two caravans. We had halted at about one in the morning, and had already drunk tea and rolled up in our bedding when in the deep hush we heard far away the faint throbbing beat of camel-bells. As they drew nearer the sound swelled slowly until the caravans were almost up with our camp, when it broke into the jangling of many different bells. It was over an hour after we heard the most distant pulsation that the first files of silent-footed camels began to go by us, their bulky shadows seeming to darken the night as one watched from the door of the tent. I got up to watch. A caravan master had ridden up first. At the position he took, the camels wheeled left and right in alternate files and then wheeled inwards again until they were head on in pairs of files. Each halted in a straight line; the camels gurgled and screamed as they knelt; the 2-foot bell on the last camel of each file clanked as it was slipped and thrown to the ground, the clamour was over, and the caravan lay in two compact squares, facing each other across a clean space." Or again, as caravans pass each other in mid-Gobi, the "camel-pullers shouted greetings to each other, with bits of news about friends on the road . . ., the passengers stared at us out of their sheepskins; and the mounted caravan-masters rode to meet each other in little groups, talking for a few moments gravely of high matters like the state of the road and conditions of pasture and water, military requisitions, disbanded soldiery, and tax collectors. A brother going east would run over to speak with his brother bound for the west, and after a few words with each other for perhaps the first time in a year they would plod away again to the west and the east, each with his file of camels, not to meet for another year or so. The camels turned their heads to stare like the men as the long files drew past each other, with a vast mingling of the slow reluctant tones of camel-bells; and in no more time than it takes for a good long stare the meeting and the parting in the red and yellow smouldering sunset, in the black desert among the thinly scattered grey tamarisks, were over."

In the third Asia Lecture, printed in the *Journal* for December last, Mr. Lattimore gave us a condensed account of his journey, and we welcome the fuller book, for not one word of his information on the various aspects of the great traffic which links East and West over the Gobi trade routes is to be missed. Whether knowledge is sought on the great two-humped Bactrian camels which carry the goods, or the giant hounds which act as camp guards and messengers, or of the actual merchandise carried in those neat compact loads, it is to be found somewhere in his volume. His previous experience of the trade which filters through to the Chinese ports from the vast hinterland made him doubly alive to all that was passing on the trade routes he followed west. To others a caravan is a caravan, but to Lattimore every caravan is a romance. "In the night, after we camped, there passed us a strange caravan laden with thousands of taels' worth of raw jade from Khotan in the ancient Kingdom of Jade. It had already been a year on the road. Some of it in big raw masses too heavy for camel-loads." And we can read a good deal more of most intriguing interest regarding that inaccessible stone. Or again, he meets a caravan of Torgut Mongols, descendants of those stout fellows who migrated from Central Asia to the Volga, and *back again* in 1770. "There was something stupendous in the march of these tribesmen from Central Asia, from one of the most outlying Mongol communities, with their women and children, their camel-loads of treasure and offering, their gowns of yellow and purple, red and green, their bold determined faces, their assured carriage, their mixed armoury of match-locks and breech-loading rifles, swords and assorted pistols, bound across the desert to China to acquire merit by abasing themselves in the presence of the holiest of

the Incarnate Divinities of Tibet." The Winding Road must be well trod, judging by the amount and variety of traffic they met.

As regards the geographical value of Mr. Lattimore's journey, his line of march from Shadun Miao to Etsin Gol, for more than 300 miles, was new as an east-to-west journey, although it crossed at different points the routes of the great Russian explorers Prjevalsky and Kozlov. At his crossing of the Etsin Gol (he skirted the famous dead city of Khara-Khoto, Marco Polo's Etsina) his forerunners were Stein and Landon Warner. His traverse of the Black Gobi between Etsin Gol and the foothills of the Kharlik Tagh—easternmost bastion of the great Tien Shan—was a seventeen-day trek, over a varied region of sand-dunes and low mountains. Of this wide area we only knew before from Ladighin of Kozlov's party. This was a true No Man's Land, situated beyond the longest arm of any law. It was a sanctuary for discontents and outlaws of a harmless nature, renegades from Government control or the authority of their own tribal chiefs. In the heart of this desolation was found the stronghold of that romantic figure "The False Lama." Whether Russian or Mongol who can say? but the account of his brief career and the fortress he built in this waste reads like an Edgar Wallace thriller. It is almost incredible that such "an old man of the mountains" could exist, and carry on for years, in the manner he did in the twentieth century. But many unusual things have been going on in Mongolia, since she threw off the Chinese yoke, and again since the Russian Revolution. On these happenings the author throws some sidelights, as he also does on the parts played by local adventurers—both Chinese and Russian—to the discomfiture of the wretched Mongols.

In short, the whole of the volume makes delightful reading, being full of information on most original lines, yet not without a spice of adventure—as the episode, which came near to being disaster, shows, when the caravan, over a thousand strong, were trapped at midnight by deep snow, at Dead Mongol Pass.

The book is accompanied by sketch-maps on the front and back end papers; insufficient to do justice to such a wide area; inadequate as well to illustrate the author's own estimate of distances. For instance, the Chinese estimate of the stage Kuei-hue to Morhgujing is 317 miles, Lattimore corrects this to 285 miles, but the map shows it at no more than 150 miles. D. C.

REVIEWS

INDUSTRIAL TYNESIDE: a social survey made for the Bureau of Social Research for Tyneside. By H. A. Mess. *London: Ernest Benn* 1928. 9×6 *inches;* 184 *pages, and diagrams.* 10*s* 6*d*

This book, by the Director of the Bureau of Social Research for Tyneside, is a careful survey of the present conditions of one of the most important industrial areas of England. It is essentially a social survey; but the first five chapters, which deal with the population and industries and the changes in them during the last hundred years, contain much material for the geographer. The introductory chapter includes a brief and clear account of the physical features of the whole area and of the sites of the several towns, as well as a summary statement of the position of Newcastle as the capital of Tyneside. It is of course also the regional capital of North-East England, and a study of its location in that region and in the "Border" would be a valuable addition.

Chapter ii discusses the population with respect to its growth during the industrial period, the origins of the many immigrants who formed a large part of the increase in the middle of last century, and the resulting "racial" composition. The important immigrants are the Scots and the Irish. The latter are the great majority of the Roman Catholics who form about one-eighth of the present population. The Scots are much less numerous, but far more influential; since while the Irish are largely unskilled labourers, the Scots are mainly skilled artisans and commercial workers. Also the Scots are much more fully absorbed in the local life than are the Irish, who remain largely a people apart.

The next three chapters are devoted to the industries, and sketch the progress of that regional specialization which has led to the concentration of Tyneside on only two major industries—coal and shipbuilding—which together employ about a third of the workers, in addition to their share of the 28 per cent. listed by the Census as General Labourers and Unskilled Workers and of the 25 per cent. engaged in commercial and transport work. It is probably well within the mark to estimate that more than half the population of Tyneside is directly dependent on these two industries. This local specialization is comparable to that of East Lancashire on cotton and West Yorkshire on wool.

The view that one important cause of the excessive overcrowding and very low standard of housing in Durham and Northumberland is in large part the fact that it was for centuries a border tract is carefully discussed (pp. 84–7). As the author notes, the hypothesis is not fully proven; but there is strong evidence for it. An extension of the comparisons to Cumberland and Westmorland might furnish additional evidence.

In chapter xi there is some account, mainly in their financial aspects, of the difficulties and inequalities in Local Government which result from the division of so definite a geographical and economic unit area as Tyneside among twenty local authorities—2 Counties, 4 County Boroughs, 2 Municipal Boroughs, 7 other Urban Districts, and 5 Poor Law Unions—though the Tyne is, in government as well as in fact, one port. The summary of the daily movements of the population shows that every one of the Tyneside towns is to some extent both workplace and dormitory for its neighbours. In association with other facts it makes a strong case for the unification of all industrial Tyneside into one city of some 800,000 inhabitants.

The book is well got up and illustrated by several sketch-maps and diagrams, and there is a good index. The Bureau of Social Research and its Director are to be congratulated on having made a valuable addition to our knowledge of a great industrial area, and we may hope that it will stimulate comparable study elsewhere.

C. B. F.

FROM TRACKWAY TO TURNPIKE: an Illustration from East Devon. By GILBERT SHELDON. *Oxford University Press* (*Humphrey Milford*) 1928. 9×6 *inches;* 178 *pages, and map.* 10*s* 6*d*

This is a well-written and very interesting book, the result of wide reading and good judgment in selection. Consequently its pages are highly suggestive, and will be a mine of sound information for future writers on Devon topography. Mr. Sheldon limits himself to East Devon, *i.e.* the region roughly defined as extending from Okehampton to Lyme Regis, and from Bampton to Newton Abbot; and such a study of the development of the highway system of a comparatively small region throws so much light on history, political, social and economic, that it is to be hoped a series of similar studies may be made for many other districts of England. The present is a sketch of the evolution of roads and through-traffic passage-ways from primitive trade routes and ridge roads, through Roman military highways—or shall we say post roads?—and the mediaeval network linking towns and villages, to the gradual rise of the turnpike system and the modern roads more scientifically planned. Successive revolutions in travel have been effected by the coming of wheeled traffic, by the rise of new industries, and by the phenomenal growth of pleasure traffic. The three maps given, of prehistoric and Roman roads, of mediaeval and pre-turnpike roads, and main turnpike roads, show at a glance that many existing roads of the first importance (e.g. the stretch from Honiton to Exeter) are the descendants of primitive tracks. Exeter, of course, has been the really important centre since Rome made it its western frontier station, and worked primitive trackways into its own system. Naturally the beginnings are somewhat nebulous: the tracks are largely inferential, and a brisk overseas commerce is rather lightly postulated for the ports from Exe to Axe in prehistoric times. But the ground becomes firmer and firmer, until we finally reach the evidence of the *British Road Book* of the *C.T.C.*

S. E. W.

THE RIVIERA COAST. By LESLIE RICHARDSON. *London: Geoffrey Bles* 1928. 9×5 *inches;* x+278 *pages; sketch-map and illustrations.* 16*s*

We congratulate Captain Richardson on having produced a book on original lines upon a theme so hopelessly overwritten as the Riviera coast. He makes his tour by sea and he writes of it as a sailor, and, as he writes well, the result is refreshing reading. Clearly he is thoroughly familiar with France and French life—he is "officier d'Académie"—and he has sailed these waters in craft of all kinds. His interest is primarily in the harbours and the shipping with its varied rigs; the fishermen and their ways; the tides and the winds, more especially the *mistral*, which has played many a trick upon him in his time; and last, but not least, in *bouillabaisse*, which he assures us should be eaten in the open air and which seems the natural food on such trips. He himself finds the characteristics of the Riviera in bees, olives, silkworms, and vines. The coast, which he follows from Cette to Genoa, wears quite a different aspect when seen from the sea. Not that he neglects to take you ashore. He is alive to the literary and other associations of the district, and is even familiar with motors and the Corniche road. But it is places like Hyères, St. Tropez, or Menton that interest him, not the fashionable resorts. Indeed, he often advises friends to go to the Riviera in November or December instead of during the season.

L. C.-M.

A GEOGRAPHY OF WESTERN EUROPE. Written by five members of the Publications Sub-committee of the Standing Committee for Geography in Public Schools. Edited by E. D. LABORDE. *London: University of London Press* 1928. 9×6 *inches;* xii+312 *pages; maps and diagrams.* 8*s* 6*d*

The Committee whose lengthy designation stands on the title-page of this book has, it is stated, as one of its main objects the obtaining of text-books "more suitable than existing ones to the needs of the Public Schools." In pursuance of this end a Sub-committee undertook to "produce a work on Western Europe which should represent the needs of the Public School geography master." No definition of Western Europe is attempted, but we are told that "the policy has been to give a geographical account of Western Europe and its civilization, and in order to do this completely it has sometimes been necessary to overstep what are commonly regarded as the limits of the area." The text is divided into eight chapters, devoted successively to a General Survey; France; the Valley of the Rhône and Saône; Italy; The Iberian Peninsula; The Rhine Valley; The Netherlands and Belgium; Scandinavia and Denmark. The Editor is responsible for chapters i and iii, and five other authors for the remainder.

Though chap. iii is limited to the Rhône–Saône corridor no reason is assigned for its separation from the rest of France, treated in chap. ii by Mr. J. H. Stembridge. Similarly no reason is given for the treatment of the Rhine Valley as a distinct unit, and the precise meaning attached to "Rhine Valley" is not made clear.

In chap. i a fairly lengthy section appears under the heading " Structure and Relief." It purports to discuss these topics on modern lines, but the author has been unable to grasp the principles involved. As proof of this statement it may be sufficient to note that the European plain is said to extend from Denmark " almost to the shores of the Pacific," to possess "extensive mineral deposits," among which the coal-beds of Wales and the North of England are specifically named, and to include the " valleys of the Saône and Rhine."

Other remarkable statements in this chapter are that Barcelona and Marseilles are examples of "deltaic ports," and that in the Mediterranean region "Absence of hinterland prevents the growth of any considerable port not based on a river-valley," a footnote stating that "Genoa, the outlet to the western basin of the Po, is a remarkable exception." Naples, presumably, together with various other ports usually regarded as "considerable," is meant to be included in the phrase "innumerable minor ports exist to serve the needs of restricted areas." Munich is said to have the same mean January temperature as Bergen; the actual figures, however, are 27° F. for the former and 34° F. for the latter.

As a not unfair example of the way in which routes are treated we may take the statement in chap. iii that "the Upper Rhône and the Isère lead to the Simplon, the St. Bernard, and the Mont Cenis passes across the Alps." It is repeated in the same chapter on a later page in a slightly different form—"the valley of the Upper Rhône, which leads to Switzerland, and, through the St. Bernard and Mont Cenis passes, to Italy."

All these quotations are taken either from the Foreword or from the two chapters to which the Editor's initials are attached, and the two chapters named are by far the weakest in the book. It would be possible to make from them a long list of elementary errors and reckless misstatements. Many of the sketch-maps in particular—the supervision of which is clearly part of the duty of the Editor—are either inaccurate or misleading so that it is difficult to avoid the conclusion that the Editor has taken his duties with the utmost lightness. He does not even appear to have read the contributions of his co-authors with any attention, for we have noted a number of flagrant contradictions between state-

ments made in his own Introductory chapter and in those devoted to particular areas, which are usually done with much greater care. It would be easy, however, to point out errors of fact and interpretation in several of the other chapters. But some of these, notably that on Italy by Mr. D. Gray, and that on the Iberian Peninsula by Mr. T. Tanqueray, do represent a definite and largely successful attempt to interpret the contribution to civilization made by the various European nations in terms of the geographical environment. Geographical facts are linked to history, literature, and art, and the real driving force behind the movement which led to the foundation of the Committee is at least made clear. M. I. N.

UNDER PERSIAN SKIES: A record of travel by the old caravan routes of Western Persia. By HERMANN NORDEN. *London: H. F. & G. Witherby* 1928. 9×6 *inches; 256 pages; illustrations and map.* 16*s*

This book is the work of an American traveller who had long been fascinated by what he had read about the Land of the Lion and the Sun. He traversed the Syrian desert in a car and visited Baghdad, Najaf, Kerbela and Basra, in all of which cities he made good use of introductions to educated natives. He then landed at Abadan, the headquarters of the Anglo-Persian Oil Company, where the crude oil is refined and shipped. He was favoured with an invitation to visit the oil-fields where "Masjid-i-Sulayman spreads itself across the flats with many oil derricks." He also visited Shushtar, where, as found by the reviewer some thirty years ago, Europeans are disliked by the fanatical inhabitants, who are described as men "with sullen faces, badly formed bodies, and the general aspect of degenerates." From Bushire the traveller was fortunate enough to visit Kharg Island, the scene of rivalry between the English and Dutch some two centuries ago. He also landed at Ganaveh—again under the auspices of the Anglo-Persian Oil Company—and motored some 70 miles inland. There he met a Qashgai chieftain, who said, "A new day has come. First Sirdar Ashair took away our flocks. Then Riza Shah sent soldiers to take our rifles. . . . My son must go to school, and then enter the army." (Sirdar Ashair was the *Ilkhani* of the Qashgais who invested us at Shiraz ten years ago, and is now a prisoner in Tehran.)

The construction of roads by the British during the Great War far outweighs any loss inflicted on Persia by military operations, and it is interesting to note how they have helped the country. Between Bushire and Shiraz, a week's journey up the infamous *Kotals*, cars now run, albeit "along precipices and around sharp turns," in two stages. (It may be noted that the road, which the British made at great cost, was not intended for motor traffic and has not since been improved.)

From Shiraz to Isfahan—some 15 stages—Mr. Norden decided to travel by caravan, braving the scorn cast on this "antiquated" method of progress, and was thus able to observe both the country and its inhabitants at leisure. There was much caravan traffic on the road, which was safe, but the soldiers complained that they had received no pay for three months, yet dared not now take anything from passing caravans, as had been the custom.

Mr. Norden considers that "the northern part of Persia is in Russian hands," and on this gloomy note he concludes. His views are those of a traveller passing through a country without knowing the language and apparently without having studied the works of his predecessors. In spite of these drawbacks he presents a generally accurate account of changing conditions in Iraq and Persia. The illustrations are good and to the point, while the map does credit to the publisher. P. M. S.

BRITISH ROUTES TO INDIA. By HALFORD LANCASTER HOSKINS. *London: Longmans, Green & Co.* 1928. 9×6 *inches;* xiv+494 *pages; illustrations and maps.* 30*s*

Professor Hoskins presents in readable fashion the fascinating tale of the opening of the routes to India. The story will be less familiar, doubtless, to American than to English readers, yet both may profit from it, for the pioneer names of Bruce, Baldwin, Johnston, Waghorn, Chesney and Lynch ought to be more familiar with us than they are.

There is a permanency about geographical conditions that ever provides a bed-rock basis for the student wandering in the maze of changing dynasties, politics and boundaries. India had become linked to England, and the geographical bearings of that great political fact impressed themselves on all subsequent policy. How could India be brought "physically" nearer? How should the routes be protected? What rivals were most to be feared? The answers of course provide the key to much of English and European History from the early nineteenth century down to the present day.

State and private enterprise both play their parts, with characteristic differences. The State officials are cautious, almost timid, over-oppressed by political considerations; private enterprise, seeking gain, is sometimes too eager, too rash, too careless of consequences to others. But private enterprise usually reaches its goal; it is surprising what commercial losses it puts up with, and undeterred tries again. There would indeed have been little geographical discovery, little opening up of lands and routes without it. Yet the State plays its part in regulating excessive rashness and selfishness, especially when there is a monopoly.

Monopoly was ever an important consideration. There were not many routes to India—the Cape, Egypt, Mesopotamia—and none of them exactly enviable. The Euphrates route (providing an early disaster) presented the insuperable obstacle of the Marshes. Yet England would never quite despair of it, so great was the need for an alternative to Egypt. The sense of it fluctuated as relations with France or Russia changed, and was to receive at last an alien expression in the shape of the Baghdad Railway of pregnant significance. Steam transit developed in adventurous fashion. Then came the insistent proposals for the Canal. English statesmen sought for every excuse to oppose it. The erroneous French surveys of Napoleon's time, indicating impracticability, were a godsend to them. It was argued that Egypt would be "cut off" from Turkey; and, too weak to stand alone, must needs, in despite of other Powers, be added to the already overweighted burden of England. The French, more shortsighted but with Napoleonic reminiscences, seem to have subscribed to the Canal in the pathetic faith that it would be another blow at "England's feet of clay." So the Canal was built, Cyprus was occupied, the great steam lines developed, and land and sea cables laid, linking India ever closer. But the consequences of the Canal were greater even than far-seeing English statesmen could tell, and some of them are ripening even now to the harvest.

The work is well documented, with very full references to a wide range of authorities, but there are a number of petty errors which should not appear in a work with pretensions to scholarship. Admiral Codrington, of Navarino fame, was not a "Lord." On p. 158, "dry season" may be an Americanism for "low season," but it is misleading. Nicholas I did not apply the phrase "sick man" to the Sultan, but, metaphorically, to Turkey. Napoleon III is spoken of as paying a visit to the King (*sic*) and Queen (of England). It was not the "life," but the "rule" of the East India Company that was terminated in 1858 (p. 406). The Company dragged on a commercial existence till 1874. It is not correct to

speak of the Bagdad (thus spelled throughout) Railway as lacking only two mountain sections when the World War broke out (p. 451); nor was Hicks Pasha's force, referred to on p. 478, an "Expeditionary" one—it was a native force of some 10,000 men with about nine European officers. But these, though irritating, are but small blemishes on a conscientious and painstaking work of real educational value at the present time. A. S. E.-S.

ACROSS ASIA'S SNOWS AND DESERTS. By WILLIAM J. MORDEN. With an Introduction by ROY CHAPMAN ANDREWS. *New York: G. P. Putnam's Sons* 1927. 9×6 *inches;* xiv+416 *pages; illustrations and maps.* 21*s*

This book describes a sporting expedition, which led the travellers from India up to the Pamirs, across Chinese Turkestan to the Tien Shan Mountains, and finally, since they were unable to join up in mid-Gobi with the Roy Chapman Andrews expedition of 1926, which failed to materialize owing to the revolution in China, forced them to pass out to Siberia through the disturbed region of North-West Mongolia.

On the publishers' dust-cover the author is described ambiguously as "the rediscoverer" of the great wild sheep *Ovis poli*, but in a geographical library his volume will have to take its place beneath the great names of Wood, Gordon, Trotter, Littledale, Younghusband, Cumberland, Dunmore and Cobbold, not to mention a swarm of Russians, including the famous hunter-naturalist Severtzoff, all of whom have long ago recorded their rediscovery of Marco Polo's giant rams.

It is ninety years since Wood crossed the Hindu Kush and stood, as the first modern traveller, on the Roof of the World. He also brought back the horns which enabled Blyth to name the species *Ovis poli*, after the great Venetian who first reported their existence six hundred years before in the very same locality. Gordon and Trotter of the Forsyth Expedition in 1873–4 also hunted on the Pamirs, and Trotter may claim to be the first Englishman to have killed *Ovis poli;* but the Russian Severtzoff had already been successful in 1867, and by 1873 he had described all the many varieties of wild sheep in Russian Central Asia! In 1888 that famous hunter and traveller, Littledale, went to the Russian Pamirs especially to hunt the *Ovis poli*. In 1889 Cumberland and Bower were doing the same on the Tagh-dum-bash Pamir. Younghusband was there too and records that Cumberland "had been successful in bagging eleven of these magnificent wild sheep." In 1890 Littledale, with his wife, hunted the whole width of the Russian Pamirs from north to south. These trophies had by now become to big-game hunters the "Head of Heads." Cumberland was after them again in 1890, also Younghusband and Macartney and Davison, also Beech and Lennard. They were followed by Dunmore in 1892, and Cobbold in 1897–8. All these climbed on to "the roof of the World," hunted and killed *Ovis poli*. Political jealousies now closed the Pamirs, which by now had become Russian territory *en bloc*. Future travellers had to content themselves with what wild sheep existed in, or were foolish enough to wander on to, the comparatively small area of "Pamir" in Chinese territory—the Tagh-dum-bash.

But in 1926 the Morden Expedition was lucky enough to get permission to hunt in Russian territory, and went, in the words of a chapter-heading, "Into Asia to prove a Theory." On p. 93 he writes: "They were said to be almost extinct—at any rate no good specimens had been brought out from the Pamirs in recent years. I noticed, however, that all the reports came from the Chinese side of the border, and that no recent expedition had operated in Russian territory. When Clark and I reached the Russian Pamirs events proved that I had been correct in my assumption that *Ovis poli*, while scarce in Chinese

territory, were plentiful in the Russian Pamirs." As a matter of fact, it has always been known that the real stronghold of *Ovis poli* is the whole series of upland valleys, called Pamirs, eight in number, if which six are in Russian territory, one Chinese, and one Afghan.

After obtaining their complete "series" of specimens at the headwaters of the Ak-su River, the expedition moved down, by the route which Marco Polo probably followed, to Kashgar. Then by way of Ak-su oasis across the Tien Shan, by the usual route to the hunting-grounds of the Tekkes valley, for ibex, and the Yulduz plateau for wild sheep. This ended the hunting season, and the expedition had to seek a way out by Siberia, since the Gobi route was closed to them. This necessitated an exceedingly disagreeable and almost disastrous trek from Urumchi across the Zungarian steppes over the Altai to Kobdo. Mr. Morden did actually make what may be justly called a new crossing of the Zungarian plains which divide the Eastern Tien Shan from the Altai. He crossed from Guchen to the Altai by a route midway between that of Sosnovski (1875) and the Potanin-Rafailow expedition of 1876–7. He crossed the Altai range by (probably) Potanin's "Ulan Daba." But the fast-approaching winter, snow-bound landscape, and rough usage by uncouth and undisciplined Mongol soldiery (which nearly ended in disaster) did not help to make this section of the journey a fruitful source of information on what was actually new ground. We still do not know much, and should like to know more, about those outlying ranges of the Altai system—the Baitik and Koko-undur and their inhabitants, the lordly Kirei. But we admire the grit of these stoic travellers who were able to endure unflinchingly the most degrading treatment at the hands of Mongols, who had never heard of the American Continent! However, they succeeded in escaping, together with most of their belongings, to Kobdo, and eventually by the Koshagach route to Novo Sibirsk, and so by rail to Peking. D. C.

WETTERLEUCHTEN IM OSTEN. By WILHELM FILCHNER. *Berlin-Schoeneberg: Peter J. Oestergaard Verlag* 1928. 8×5 *inches;* 301 *pages; illustrations,* 2 *plans, and* 4 *maps*

This is a peculiar book. It has all the appearance of being a new issue. Only by a chance examination in the Library did the fact emerge that it is a reprint by the author of a book which he called 'Sturm über Asien' in 1924, published by Neufeld & Henius, and reviewed on p. 415 of the *Journal* for November 1924. The letterpress and maps are identical; the illustrations and binding only are different. It is regrettable that the author should take this way of puzzling both reviewer and reader. He adds to our perplexity when he reproduces, on p. 48, a photograph of "The Potala at Lhasa," which many of us will recognize as Drepung Monastery taken from a new angle; and, on p. 89, a purely fanciful drawing of a column of British troops marching in at the lower gate of the Potala, an incident which never occurred. His photograph of the Buddha at Gyantse has, I believe, been taken straight from Landon's first volume.

This combination of disloyalties to the reader goes far to confirm the opinion of those who would place the book in the indeterminate category of Ossendowski —which, in the reviewer's opinion, would be wrong. In brief, the book is a history of one Zerempil, a Buriat graduate in the Russian secret service, who seems to have been behind the scenes in nearly all the unpublished doings of Central Asia for the thirty years 1890 to 1920, and to have been the working impulse behind Dorjieff, a fellow-monk in the monastery of Kumbum near Sining-fu, and whom we have hitherto held solely responsible for our troubles with Lhasa in 1904. It is Zerempil who appears as the organizer, on the spot, of every detail of the Tibetan resistance to Sir Francis Younghusband's Mission.

Zerempil again organizes the rising on the eastern borderland of Tibet against Chao-Erh-Feng's advance. Zerempil's is the diplomacy which secures, at Peking, the Dalai Lama's return to his capital, and his is the plan which makes the subsequent flight to India successful. All these phases might even then be taken to be flights of imagination by the author, were not the sequence of corroboration too strong for coincidence. Small unemphasized touches here and there are demonstrably true. One instance sticks in the mind: his description of the appearance of the sandbags on the walls of Changlo, unimportant trifles which neither Landon nor Chandler mentions, and known only to us of the Mission who built them, and to the Tibetans in the Jong who daily faced the fire directed from behind them. Minor corroborative details about Chao-Erh-Feng, also, compare well with the knowledge of those of us who have been permitted to lift a corner of that veil and look inside. And there are details of the Dalai Lama's crossing of the Jelep La. Such instances multiply.

A steady note of not too bitter Anglophobia marks the author's unfolding of the story: a matter which we can well forgive to a man who uses an unadorned and vigorous medium in which to express what are, to him, obvious truths. This tendency is very marked in his chronological table, which takes the place of an index and in which he brings a quantity of fortuitous events into planned and reasoned interdependence, to the satisfaction of his Anglophobia but to the almost impossible credit of our simple and straightforward diplomacy. Reading this table, no uninformed mind could help believing that England has, in the last thirty years, been up to some remarkably crooked work in Central Asia.

And yet, with all this Anglophobia and with all the remaining inconsistencies and perplexities with which the author surrounds the reader to antagonize us, we are left convinced of the entire sincerity of the work and of the author's personal belief in facts which he has gathered, first hand, during a verifiable two and a half years' stay at Kumbum, where he seems to have been in personal touch with all his principal characters. Apparently they hid nothing from him. On the whole it is a remarkable book, and one which fills a wide gap in our knowledge of the events with which it deals; also, possibly, less a history of the past than a preface to events foreseeable within a measure of years. L. A. B.

THE PILGRIMS' WAY IN SOUTH AFRICA. By DOROTHEA FAIRBRIDGE. Frontispiece by R. GWELO GOODMAN. 104 other illustrations. *Oxford University Press: Humphrey Milford (London)* 1928. 8×10 *inches;* xii+196 *pages.* 21*s*

This book has a large number of remarkably good illustrations, which, taken with the text, makes it an excellent guide to South Africa. That is, it shows us what the land looks like, how the country folk—the whites rather than the natives—live, and the varying conditions found in such widely different regions as the high veld of Rhodesia and the sugar and cotton lands of Natal and Zululand. Miss Dorothea Fairbridge takes us from the Cape to the Victoria Falls, shows us little-visited districts of the Northern Transvaal and East Griqualand, besides other places more familiar, and has descriptions of Johannesburg, Pretoria, Durban, and other towns. She has the artist's eye for colour and form, the botanist's enthusiasm for all that the ground produces (especially flowers), and the naturalist's fondness for bird and beast. Probably the most intense impression she conveys is that of intense sunlight. She is an apostle of beauty and laments again and again the corrugated iron so widely used for roofing houses, houses which, if modern, are usually unattractive otherwise. "The new and smaller country towns are fast assuming an aspect of deadly monotony," and the boekveld farmer has no eye for aesthetics. Miss Fairbridge, as any

thoughtful South African must be, is perplexed by the problem of the native, with his growing demand for education and increasing economic importance. "To meet this vast problem we have a disunited white people," she observes, truly and sadly. On one point she seems to be under a misapprehension. The whites in South Africa are increasing at a higher rate than are the blacks—so that the disproportion in numbers between the two races may not alter materially. Historical information is given by the way, as various places call up old associations. In one instance Miss Fairbridge falls into a double error: the Articles of Peace which ended the Boer War were not signed at Vereeniging but at Pretoria (whither the Boer leaders went after their deliberations at Vereeniging), and General Smuts was not one of the signatories of the Articles.

The frontispiece is a very effective reproduction in colour of the Hex River Valley—with its vivid rose-red hills and dark shadows—by Mr. R. Gwelo Goodman, and there are several scores of other illustrations. They include thirty-two photogravures from photographs by Mr. Lancelot Ussher. These are excellent, and Mr. Ussher deserves high praise. The sea and sky and mountain effects are very fine, as are also the numerous illustrations of flowers and trees, shown not as museum specimens, but as in nature and in the mass. Mr. Ussher even makes the mine dumps on the Rand things of beauty and of mystery. The other illustrations too, for example those of the Victoria Falls, are delightful, and all are appropriate in that every one does illustrate some point in the text. F. R. C.

GEOLOGIE AFRIKAS. By J. KRENKEL. 2. Theil, Vol. 2. (Geologie der Erde.) *Berlin: Gebrüder Borntraeger* 1928. 10×7 *inches; pages* 463–1000. *Marks* 45

The second volume of Krenkel's 'Geologie Afrikas,' one of a series on the Geology of the Earth, maintains the high standard of its predecessor. It deals with Southern Africa, in which are included not only the Union of South Africa, but the Portuguese territory up to the Lower Zambezi, while farther west the boundary follows in general the Zambezi–Congo watershed. This volume has had the great advantage of following the detailed mongraph by Dr. du Toit, issued in 1926; but Professor Krenkel's book gives full evidence of having been prepared independently, and as it is two years later, it includes reference to much important recent literature. The work is a remarkable achievement from an author who apparently has not studied South Africa personally. The two sections of the volume of most geographical interest are the introductory account of the morphology and the final chapter on the mineral resources. In his account of the physical geography the author lays stress on the "Great Escarpment" which separates the interior plateau from the coastal hills and plains. In honour of Dr. Rogers, the head of the Geological Survey of South Africa, the author has renamed this structure the Rogers-Stufe or step. He introduces another change in nomenclature which is less likely to be welcomed in South Africa, for he defines the "Great Karroo" as a narrow strip between the foot of his Rogers-Stufe and the Cape Mountains; the Great Karroo would thereby lie south of the Nieuweveld-berg and the Sneeuw-berg escarpments. The high plain to the north he calls the "Ober-Karroo"; but it is the Great Karroo of South African geographers, and is so described in some of Prof. Krenkel's later maps (*e.g.* pl. 34, opp. p. 903). In the structure of South Africa he recognizes the influence of four main periods of mountain building, three of which are pre-Paleozoic namely the Proto-Afrizids, which were formed at the end of the Swaziland System, the Mezo-Afrizids at the end of the Barberton System, and the Neo-Afrizids which, according to Dr. Krenkel's classification, were in part Paleozoic, for he includes therein the Matsap and the Waterberg Sandstone. He is there

in agreement with some South African geologists, but from the absence of fossils in this thick series of sandstones and the disturbance of the bed by very ancient folds, there is much to be said for the reference of these rocks to the pre-Paleozoic as the equivalent of the Scottish Torridon Sandstone, and of the American Keweenawan. Originally many South African rocks now universally accepted as pre-Paleozoic were regarded as Paleozoic, and some geologists have made the same change with the Waterberg Sandstone and its equivalents; but there is naturally hesitation in adopting this step until the evidence is conclusive. After the Neo-Afrizids the last mountain folding raised the Cape Mountain System of the "Kapids," which is certainly late Paleozoic or even a little later.

The bulk of the volume is occupied by a detailed geological description of South Africa, with valuable sketch-maps, diagrams, and bibliographies, which are a useful supplement to those in du Toit's work. Among the problems of special geographical interest it may be noted that the author claims (p. 747) the Kunjas conglomerates as of marine origin and as therefore marking a pre-Paleozoic advance of the sea into south-western Africa; but as these beds are described as red-brown sandstones with iron-shot gravels, the evidence for their marine origin is not quite convincing. The author accepts various tillites, with some of pre-Paleozoic age; he therefore regards South Africa as having been subject to glacial action at different dates. He gives an excellent account of the Upper Paleozoic boulder clay, the Dwyka Conglomerate, the formation of which he accepts as due to an ice-sheet that covered most of South Africa. Whether this glaciation was due to one or to several advances of this ice Dr. Krenkel regards as still doubtful.

Amongst the excellent illustrations may be remarked those of the skeletons of *Moschops* and of the heavy-skulled *Endothiodon*, which are less well known in this country than some other extinct African reptiles, as they are preserved in the New York Museum. The age of the igneous rocks and the associated sediments in the Lupata Gorge of the Zambezi has an important bearing on the date of the main volcanic period of Eastern Africa. These beds have been assigned to the Lower Cretaceous, and it is interesting to note that Professor Krenkel (p. 854) transfers them to the Upper Kainozoic and even Pleistocene. The chapter on the economic geology gives brief but instructive accounts of the chief ores and valuable minerals. In regard to the much-discussed origin of the gold in the Rand Banket, he dismisses both the precipitation and infiltration theories and favours that of the sedimentary origin of the gold. A short account is given of two of the chief occurrences of the platinum ores, the most interesting recent addition to South African mineral resources. The famous diamond pipes are attributed to explosive volcanic eruptions in the Lower Eocene; and the diamonds themselves—their derivation from the underlying eclogites being rejected—to the crystallization in the uprising carbon-laden Kimberlite-magma. The author does not discuss the third hypothesis that the volcanic action was of a hydro-thermal type, and that the diamonds were formed by the pneumatolytic action of superheated steam on a decomposing basic volcanic rock. As an instance of the changes in terms due to retranslation, it may be noted that he adopts "Fastebene" as the rendering of peneplane, and in one place explains this term as meaning "wonderful even plain." J. W. G.

CHRONICLES OF KENYA. By A. Davis and H. J. Robinson. *London: Cecil Palmer* 1928. 9×6 *inches;* 311 *pages.* 7*s* 6*d*

The authors are careful to state that 'Chronicles of Kenya' is a work of fiction, but those of us with vivid memories of that fascinating country would be more inclined to call it a work of truth.

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The chief characteristic of the Kenya settler is his sense of humour, a quality of which Mr. Davis and Mr. Richardson both have a full share, and which has enabled them to give us a picture of the country with all its whimsicalities. In a series of short chapters they level their wit impartially at the official, the settler, the missionary, the native, and the Imported Expert. They even extract fun out of the currency question. All these points are touched on in the lightest and cheeriest manner, at which not even the most bigoted could possibly take offence. The book is full of capital stories and packed with delightful burlesques of those side problems which Kenya imagines to belong to herself alone but which in reality belong to every country where British initiative has made itself felt. The authors remark that the true history of the East African campaign has not yet been written. Nobody is more qualified for such a task than they are themselves.

P. W.

COTTON MILL PEOPLE OF THE PIEDMONT: A Study in Social Change. By MARJORIE A. POTWIN. Columbia Studies in History, Economics and Public Law, 291. *New York: Columbia University Press* 1927. 9×6 *inches;* 166 *pages, and a map*

Were it not for the brief sketch of the cotton manufacturing industry and peoples of the Piedmont which precedes a detailed sociological account of *one* of the cotton mill villages in South Carolina, the title of this work would be more misleading than it is. Fortunately, the preliminary survey does provide a background, condensed but clear, placing the industry in its true historical and geographical setting, partly justifying the comprehensive title and serving as an explanation of the factors behind the sociological phenomena described in the main part of the book, where the aim " has been to consider the people rather than the industry; their social psychology and developments rather than the economic and political conditions that have produced the observed results."

A decade of work as "recreational leader" in a mill village (which in the author's opinion is typical of industrial centres in the Piedmont), shrewd observation, and a lively interest in the people, have resulted in a vivid picture of the social changes taking place in the cotton-belt as the result of transition from agriculture to industrialism. Familiarity with the mill folk is abundantly proved by the use, both in and out of quotation marks, of such expressions as "raised rough" and "paw chaws terbaccer," and at times the work might be thought to depart from the high seriousness expected of a study in sociology.

H. A. M.

DISCOVERIES AND ADVENTURES IN CENTRAL AMERICA. By THOMAS GANN. *London: Duckworth* 1928. 9×6 *inches;* 262 *pages, and illustrations.* 21*s*

The present volume is the fifth of the series (so far published annually) dealing with the explorations of Dr. Gann in the outlying regions of the colony of British Honduras. Familiar with local conditions during the many years of his work as Medical Officer in the colony, Dr. Gann knows men and manners in this strip of the Caribbean coast; and here, by an accident of fate, is a treasure-ground for the archaeologist. Here was the main road of movement of the great Maya race, apparently, and here some of the strange and magnificent remains of their culture lie hidden in the tropic forest, evidence of the genius for architecture and stone working, religious organization and calendrical skill, of the vanished peoples of this mysterious region.

During the last two seasons the British Museum has worked in the colony, under a concession from the British Honduras Government, and Dr. Gann has

collaborated with these official expeditions. The story of his experiences in the last days of 1927 and the early part of 1928, both as independent explorer and associate of the British Museum expeditionaries, is told in the book under review. A story of hitherto unexplored ruins spurred Dr. Gann to make, from Punta Gorda in the southern part of the colony, the ascent of the Mojo river to its junction with the Joventud branch; from here his party proceeded "along an abominably bad hilly trail, ankle-deep in mud," for a mile and a half. And there, "buried in the depths of the primeval forest, just as its inhabitants had left it some fifteen centuries ago, was a most beautiful little Maya Old Empire site, consisting of a plaza surrounded by six ruined temples, and containing at least fifteen stelae, upon which were recorded the dates of their erection." The site, Dr. Gann concludes, must have been of great importance in the days when the surrounding lands were densely populated, more than fifteen centuries ago. He points out that this is the only site of its kind in British territory; it is, he says, "devoutly to be hoped that complete excavation may be undertaken by some British institution, and that some of its magnificent stelae may find a permanent home in our national museum." In this connection it may be noted that an expedition organized by the British Museum left England at the end of January with the object of spending the 1929 "dry season" of British Honduras in work upon this site.

From the south Dr. Gann went north to Belize, and thence to Benque Viejo, near the point where the western boundary of the colony adjoins the Peten region of Guatemala Republic; in the Peten area there are ancient Maya ruins strangled in forest, with the famous Lake Peten and its island city of Flores in its heart. The civilization of these great artists, astrologers, and artisans spread north and south during the period of its great growth, and it is not impossible that the key to the problem of the fall of Maya culture may be found in the neighbourhood.

Dr. Gann's object on this occasion was the examination of caves full of stalagmite and stalactite formation, which had served as retreats for the ancient peoples; for upon the floors of some were found enormous collections of pottery. "There were hundreds of these vessels, of every conceivable shape and size, from the tiny food bowl, holding perhaps half a pint, to the immense receptacle for *atole de maiz nuevo*, holding nearly 15 gallons. There were amphora-like jars for holding water, of fine, thin, hard pottery; large, thick, coarse flaring-mouthed vessels for the storage of beans, corn, pumpkin-seeds, and other light, dry articles of food; numbers of round, blackened cooking-pots; shallow dishes, some of coarse pottery, others of tough polished red ware, probably for the reception of cooked foods and fruit."

Some of these objects, together with fragments or casts of stone stelae from the Joventud River site, etc., the fruit of later work, were subsequently placed on view in a special room in the British Museum, and no doubt serve to stimulate public interest in exploration work in one of Britain's little-known tropical possessions.

L. E. J.

THE LAND OF TO-MORROW: A mule-back trek through the swamps and forests of Eastern Bolivia. By HENRY M. GREY. *London: H. F. & G. Witherby* 1927. 9×6 *inches;* 224 *pages; illustrations and sketch-map.* 12*s* 6*d*

This is a very readable account of a journey undertaken by the author some years before the European War, in the remote tropical lowlands on the western side of the upper Paraguay basin. Commissioned to survey certain rubber-producing concessions, Mr. Grey found abundant other interests on his long journey on mule-back by trails through swamps and forests, over grassy plains

and along the partly settled lower slopes of the Bolivian Andes. One realizes well, on reading such a book as this, what a field still remains in this vast region for Man's conquest of Nature, how little progress has really been made during the four centuries of (nominal) European occupation. It seems a wonder that people should be found contented to live lonely existences at scattered points in these wildernesses, where the only means of communication are uncertain and often impassable trails.

Whether writing of the simple daily happenings, or describing the scenery and plant and animal life, Mr. Grey keeps an easy hold on the reader's attention. He is perhaps at his best in presenting by a few simple strokes the characters of the various unusual people he met. His object has been to interest and amuse, rather than to write a profound scientific treatise, and in that he has succeeded. The photographic illustrations are well chosen, the map serves its purpose, and the general get-up of the book is pleasing. E. W. S.

HANS STADEN: THE TRUE HISTORY OF HIS CAPTIVITY, 1557. Translated and edited by MALCOLM LETTS. The Broadway Travellers Series. *London: George Routledge & Sons Ltd.* 1928. 9×6 *inches;* xx+192 *pages; illustrations and maps.* 10s 6d

The valuable record of the German gunner, Hans Staden, concerning his adventures during the middle of the sixteenth century, and particularly the period of his captivity among the Tupinamba of southerly Brazil, is known to students of the American colonization period from the volume issued by the Hakluyt Society. But that edition was printed in 1874, and copies are not readily obtainable; Mr. Letts has performed a useful service in making a new translation, and the Broadway Travellers in utilizing a human document of genuine interest. The reproduction of the old woodcuts, made for the first German edition printed in Frankfort in 1557, adds a great deal to this well-produced and carefully printed volume.

Hans Staden was no hero, but he was a shrewd young man who, after a cruise or two, found himself near the present port of Santos at a time when the Tupinamba Indians were openly roused against the colonizing Portuguese. Hans, in Portuguese service, was caught by a band of these warriors, held prisoner, and prepared for a ritual feast; he escaped death only when his hosts became convinced that he was not a Portuguese, and eventually, by the exercise of his wits, he managed to make a reputation as a medicine-man. He escaped in 1555, got home in the same year, and set to work to produce a book which can have been little less than a revelation to his stay-at-home compatriots.

All news of the New World, closed to outsiders by the Spanish and Portuguese, was of thrilling interest in the sixteenth century, and Hans' story ran into as many editions as a "best seller" to-day; it was translated into several languages. It remains a work of importance concerning the ways of life of the Brazilian Indians of the south coast, fated to disappear for ever from the regions where the German adventurer was kept a prisoner. Few men had a similar opportunity, or used it better; for although Hans was a terrible coward, and has no shame in speaking of his fears and tears, he was a good observer and did not draw the long bow. The second section of the book is concerned with Tupinamba methods of preparing food, their use of weapons and utensils, living customs, amusements, animals and plants of the country, etc., and the accuracy of Hans Staden's notes remains unchallenged. L. E. J.

THE TONGARIRO NATIONAL PARK, NEW ZEALAND. By JAMES COWAN. *Wellington: Tongariro National Park Board* 1927. 8×5 *inches;* 156 *pages; illustrations and maps.* 7*s* 6*d*

New Zealanders are exceedingly fortunate in having almost at the centre of the more populous island a wonderful domain of nearly 150,000 acres, containing great volcanic peaks of which one is still active and another has considerable glaciers, set in a region rich in other thermal phenomena, and combining all this with the beauty of forest and stream.

The well-illustrated book which Mr. Cowan has prepared, gives for the first time a full account of this region; the scenery, the geology, the botany are each given attention, and in addition we have the history of exploration in the region, the means of access to places of interest, and abundant references to native folklore. The strong Maori flavour which this district of former *tapus* still preserves, makes it one of special attraction to New Zealanders. Indeed, Mr. Cowan has obviously compiled this book more for his countrymen than for the outside world.

Such a wonderful theme deserves a high standard of writing, but the style in this book strikes one as too florid and frankly journalistic and the material appears to have been rather hurriedly put together, so that the work as a whole is rather disjointed. It will certainly prove an excellent guide-book, and perhaps something more, though not as much more as it might. The two large maps supplied are clear and serviceable, but it is a pity that they have been printed on opposite sides of the same sheet, so that mounting is not possible. E. W. S.

DIE OSTERINSEL. By WALTER KNOCHE. *Concepción: Verlag des Wissenschaftlichen Archivs von Chile* 1925. 7×5 *inches;* 320 *pages, and illustrations.* 9*s*

"The Mystery of Easter Island" continues to focus attention on one of the most romantic and interesting spots upon which the Polynesian races have left the impress of their peculiar genius. What Mrs. Routledge has done for the English public has been attempted for German readers by Dr. Knoche in a work which does ample justice to the subject, containing not only the results of a special scientific expedition organized in 1911, but also those of an immense amount of preliminary research on the author's part.

The book is subdivided into a number of subsections, in which every scientific topic relating to the island is given its share of treatment. Thus we have information not only on the Geography, Geology, Fauna, Flora, and so forth, but also on the customs, religion, folklore and ethnological characteristics of the people. Special attention is rightly given to the decorative and symbolic art of past generations, and in particular to the striking stone monuments in the shape of human figures, many of which are still standing, staring with absent-minded gaze over the waters of the Pacific.

Dr. Knoche knows his subject well—perhaps too well. He is so intent upon presenting his facts and sifting evidence that his book seems rather too matter of fact in places; yet in the sections on folklore and history he shows that he is not without appreciation of the romantic side of the subject. Taken altogether, his book forms a useful summary of much original scientific work. E. W. S.

FLYING THE ARCTIC. By Captain Sir G. H. WILKINS. *New York: G. P. Putnam's Sons* 1928. 8×5 *inches;* xvi+336 *pages; illustrations and sketch-map.* 10*s* 6*d*

Sir Hubert Wilkins describes not only his remarkable flight of 2200 miles from Alaska to Spitsbergen made in April 1928, but also, and perhaps at greater length, the failures and set-backs which were the fortune of his earlier attempts

in 1926 and 1927. Readers will learn that the successful flight was not a mere lucky adventure to attain notoriety, but was, in effect, the final outcome of prolonged efforts to apply modern transport to solving some of the few remaining problems of exploratory geography. This book, too brief almost in view of the revolution which it marks, makes clear that polar flying, other than non-stop flights, requires not only an arduous apprenticeship in learning the care and maintenance of the machine and engine in cold weather, but also first-hand knowledge of ice and snow conditions, only to be learnt by personal travel on foot or with dog teams on the land itself or, as in the present instance, on the ice-pack of the Arctic Ocean. Wilkins' experience of the latter came to him when a member of the Canadian Arctic Expedition in 1913–1917 under Vilhjalmur Stefansson. The other apprenticeship was bought at a price in 1926 and 1927. Perhaps the greatest of all the flights, in all four over pack-ice, was that of 1927, when no fewer than three forced landings, all successful, were made on the ice-pack. The story is excellently told, and not without its thrills.

There are practically no photographs other than those of the different aeroplanes. It is disappointing to find no single view of the Arctic pack despite the many references made to its varying nature. The map, not cited in the contents and list of illustrations, is also inadequate. Omissions such as these are no doubt explained by the short interval between the Arctic flight last April and the author's departure for the present season in Graham Land. The success, one might almost say the foregone success, of the Antarctic sequel is here made clear; and even more so is Wilkins' unusual skill as an air navigator. This in itself was sufficient to make the Alaska–Spitsbergen flight the most notable in a great air year, and perhaps even, as Amundsen says, "incomparable and unsurpassed." J. M. W.

THE BOOK OF POLAR EXPLORATION. By EDITH L. ELIAS. *London: George Harrap Ltd.* 1928. 8×5 *inches;* 302 *pages; illustrations and sketch-maps.* 7*s* 6*d*

A short account of the main events in the history of Polar Exploration is always sure of a welcome. The present book is well written, and, while laying most stress on the more stirring side of polar work, does not altogether overlook the accumulation of scientific knowledge by less spectacular expeditions. The general apportionment of space is good, but perhaps more so in Part I, which deals with the Arctic, than in the Antarctic portion: in the latter no mention, for instance, is made of Smith and Bransfield. The front and back covers contain Arctic and Antarctic charts respectively, but in both the mistake has been made of denoting the edge of the pack-ice as an "ice barrier," though the same wording is also used correctly for the Ross Barrier. Other mistakes are few, and the whole makes a very readable account on popular lines; it is well got up and exceedingly well illustrated. J M. W.

LES TRAITS ESSENTIALS DE LA GÉOGRAPHIE HUMAINE. By COMMANDANT J. ROUCH. *Paris: F. Nathan* 1927. 7×5 *inches;* 270 *pages.* 9 *fr*

This little volume is one of the series of introductory manuals in the 'Bibliothèque des Educateurs.' In twenty-three short chapters the author deals with a very wide range of topics, including the distribution of population and the location of towns, ways of communication and most of the great industries, as well as types of agriculture. He keeps close to facts; and if his deductions often seem very obvious, he does avoid extravagant generalizations. The book can be warmly commended as an introduction to the work of the great French school of human geographers. C. B. F.

THE MONTHLY RECORD

ERUPTION OF ETNA

Prof. Salvatore di Franco, of the University of Catania, gave a brief analysis of the recent eruption of Mount Etna in *Nature* (No. 3085, 15 December 1928). From the sketch-map it is at once apparent how free the district invaded by the lava had been from previous calamities. The lava is seldom ejected from the main crater, but issues from vents in the walls, probably opened by the great pressure. Without warning, at 3.30 p.m. on 2 November 1928, an explosion occurred in the highest crater on the north-east side. One and a half hours later, a vent opened below in the Val del Leone (2700 metres): the subterranean lava continued its course to the eastwards, and broke out again south of Monte Frumento, the lava invading the plain of the Donne. The following evening the subterranean lava opened another vent at a level of 1150 metres in the region of La Naca. This flow finally reached Carrabba, within 1500 metres of the sea, wiping out the fertile district of Mascali on its course. Thus, though one of the feeblest recorded eruptions, this, by destroying the flourishing fruit groves and vineyards, has done immense damage, greater than many eruptions of longer duration. The lava at its emergence appeared like a flow of viscous incandescent metal: lower down its movement was marked by the sliding of the great masses which cover the molten interior, and the sweeping forward of blocks in the advance. With the increasing pressure, the molten lava frequently burst through the solidified "lateral moraines," threatening fresh areas. The temperature of the lava at the vent was 1050°; the low surface temperature of the flow lower down was evidenced by the slightly charred trees carried along. By November 18, all external manifestations had ceased. About 700 houses were destroyed and 1200 ha. of cultivated land laid waste. The occurrence of the eruptions of Etna are very irregular: in the nineteenth century ten great eruptions took place: between 1892 and 1910 there were none of importance, since when there have been four.

GERMAN GEOGRAPHICAL STUDIES

Several additions have lately been made to the valuable series of studies entitled *Forschungen zur deutschen Landes- und Volkskunde*, of which they form volumes 25 and 26. While it is not possible to review them all in detail, brief notes on four of them will indicate the present scope of this series. The division implied in the title is fairly maintained, though even those classified as "geographical studies" are devoted in considerable measure to the "human" side. 'Das Bitburger Land,' by Dr. E. Meynen, is a systematic and very detailed study of a small region north of Trier, between the Prum and the Kyll. This entrenched tableland of Jurassic and Triassic rocks contrasts clearly both with the neighbouring Eifel and with the rich Luxembourg lands. Agricultural country entirely, its population is evenly distributed, for of its 348 towns and hamlets, 8 only have more than 1000 souls. Perhaps the most interesting part of the work is the results of research into the progress of settlement from paleolithic times onwards. Lying on the route between the important centres of Trier and Cologne, the region came under Roman influence. Bitburg is a Roman site, but it was the Germanic invaders, avoiding the higher ground and seeking timber, meadow land and water, who began the clearing of the forest. Dr. Meynen has compiled, from a study of place-names, tables showing the probable foundation-date of the settlements. The ninth, twelfth and thirteenth centuries are the eras of expansion, the fourteenth and fifteenth of virtual stagnation. This study is well illustrated and supplied with sketch-maps and a map showing the effect of recent consolidation of scattered holdings. The other

geographical study, slighter and less detailed, is concerned with a contrasted landscape, the low district around the lower Hamme, a sub-tributary of the Weser, to the north of Bremen (Das Hamme-Urstromtal: Worpswede und das Teufelsmoor, by Dr. F. Schwieker). The study describes the settlement and drainage of the broad valley cut by the Hamme and its post-glacial forerunner in the surrounding "Geest," and covered by alluvium but for isolated remnants, by the most prominent of which—the 51-metre-high Weyerberg—stands Worpswede.

In his 'Wandlungen im Posener Landschaftsbild zu Preussischer Zeit' Dr. W. Maas deals with a controversial subject, as he cannot avoid discussing Prussian policy, particularly with regard to land settlement. However, his conclusions are interesting as revealing considerable movements of population since the war, almost on as great a scale as the Græco-Turkish exchange. From the area of Posen ceded to Poland, between the years 1910 and 1921 332,000 Germans migrated, and were replaced by 366,000 Poles. If similar figures for the other provinces are considered, a total movement covering nearly two millions of people, Germans and Poles, is revealed. The migration has been proportionally greater from the towns than from the country: between 1910 and 1921, the percentage of Germans in the towns fell from 46 per cent. to 14 per cent.; the corresponding figures in the country being 30 per cent. and 19 per cent. In Posen itself the change is even more striking: in 1910 Germans were 41 per cent., in 1921 6 per cent., in 1925 2 per cent. This greater migration from the towns is accounted for to some extent by the large Jewish exodus. This migration is by no means a post-war phenomenon: in 1907, e.g., there were in Germany half a million persons born in Posen. Dr. Maas connects migration with the existence of large estates and not primarily with the fertility of a particular district. In Posen, as elsewhere, the last half-century has witnessed the great growth of towns: between 1870 and 1910 the agricultural population increased 11 per cent., the town population 111 per cent.

The last study, 'Die Entwicklung des Mecklenburgischen Niedersachsenhauses zum Querhause und das mecklenburghische Seemannshaus,' by Gehr. J. F. Pries, is a specialized account of the development of two German types of house-plans in Mecklenburg, originating in the one large room sheltering persons and farmyard animals indiscriminately. The author gives details of construction, sketches and plans of buildings, and extracts from government regulations, which show how great was the danger of fire in sixteenth-century villages. This study should be of much interest to the social historian.

A GREAT METEORITE FALL IN SIBERIA

On 30 June 1908 the fall of a giant meteorite which, to judge from its effects, must have far exceeded anything of the kind recorded in history, was reported from North-Eastern Siberia, having been both seen and heard by many observers; but as the spot on which it fell was in an uninhabited wilderness, it could not be located with any precision. The unusual nature of the phenomenon was proved by the fact that the sound-waves were registered by barographs at Kirensk and Irkutsk, and that the earth-waves due to the impact were also recorded by the seismographs at the latter city. A study of such records indicated the site as lying on the hilly plateau of the Stony Tunguska, a tributary of the Middle Yenesei, in about 60° N. lat., 90° E. long., but for some years no more precise information was obtained. In 1921 the subject was taken up by the Russian Academy, and preliminary inquiries were made, which elicited the fact that by reason of the intense atmospheric pressure large areas of forest had been laid low. Only in 1927 was it found possible to organize an expedition

in search of the spot in question. This was entrusted to Leonid Kulik, of the Academy, and reached its goal in spite of many difficulties and hardships. A short summary of his narrative appears in the last number of *Petermanns Mitteilungen* for 1928. At Taishet the railway was exchanged for sledges, and the journey was continued amid snowstorms and at a temperature of −40° C. through the boundless coniferous forests. From Keshma on the Angara a reindeer track through the *Taiga* was followed, and as the party approached the region of the Stony Tunguska, they were struck with the frequency of burnt patches in the forest. Reaching the factory of Vanovara on the Tunguska about the end of March, Kulik obtained the services of a Tungus family with their reindeer, but the deep snow made progress slow, and even the reindeer path at last came to an end. By pressing on on snow-shoes Kulik reached a commanding spot whence a view to the north showed a vast snowy expanse, bare of forest, which he took to be the locality he was in search of. A further advance being impossible, he returned to Vanovara, determined to make a new attempt by water, as the rapidly melting snow made land-travel impossible. Rafts were built, and the ice-obstructed streams were navigated with the greatest difficulty, the men having frequently to carry the baggage on their backs through the rapids. Pushing desperately on, Kulik took notice of the varying directions in which the trees had been prostrated, and at last convinced himself that he had actually crossed the spot on which the meteorite had fallen. The heated gases and solid particles must have spread out in all directions from the point of impact, carrying devastation around, and either overthrowing the trees or tearing or burning off all their branches. About ten shallow craters were found, with diameters of 10–50 metres and an average depth of 4 metres, their bottoms being covered with bog-moss. The traveller was almost at the end of his resources and was quite unable to excavate the ground in search of fragments of the meteorite. He reckons the area affected by the tornado at hundreds of square kilometres.

THE MUFUMBIRO VOLCANOES

In the Record for December 1928 we noted briefly visits to volcanoes of the Mufumbiro range, on the Congo–Uganda border. We have since received from Capt. Tracy Philipps a short note upon two volcanoes of this group, Namlagira and Ninagongo. Nine years ago Namlagira gave a wide and constant glare into the night sky, while by day the heavy yellow smoke was conspicuous on the horizon. The glare was distinctly visible, despite the dry season haze, from the mouth of the Ishasha river on Lake Edward, over 70 miles distant. At present, however, the smoke is not noticeable to the casual observer, and the glow is much reduced, being scarcely visible at half the distance and under better conditions. Capt. Philipps also reports that Ninagongo, which was quiescent in 1920, is again active. This bears out in some measure the local native tradition of an eight-year cycle.

NEW ACCOUNTS OF CAPTAIN COOK'S DEATH

The main incidents attending Captain Cook's death at Kealakekua are known, principally from Captain King's account in the official narrative of the third voyage. Lieut.-Commander R. T. Gould, however, has discovered in the Public Record Office several hitherto unpublished logs and journals, which throw further light on the circumstances, and he is also able to advance an explanation of Lieut. Williamson's conduct. These extracts are published in the *Mariners' Mirror* for October 1928. The first log is that of Captain Clerke, who succeeded to the command, but died before the return to England. Clerke describes the attempt on 13 February 1779 to recover the armourer's tongs,

when an unarmed boat's crew came into conflict with the natives, "in consequence of which was a defeat. . . . This was an unfortunate stroke as matters now stood, as it increased the confidence of these People which before was too much bordering upon insolence." This log is important as it contains the statement of Lieut. Molesworth Phillips of the Marines, the only officer on shore with Cook at the time of his death. Cook had practically abandoned his intention of persuading the chief 'Terre'aboo" to go on board, saying, "We can never think of compelling him to go on board without killing a number of these people." The marines had been drawn off and were lining the shore, when a native molested Cook, who discharged a "load of small shot" at him. This did not penetrate the thick feather cloak the man was wearing and "had no other effect than further to provoke and encourage them." Cook then fired a ball, killing a man, and the melée became general. Phillips writes of the "Indians"—"these fellows instead of retiring upon being fired at, as Captain Cook and I believe most people concluded they would, acted so very contrary a part, that they never gave the soldiers time to reload their Pieces but immediately broke in upon and would have killed every man of them had not the boats by a smart fire kept them a little off. . . ." The second document is the journal of Thomas Edgar, master of the *Discovery*. He describes the encounter with the natives on the day preceding Cook's death, at which he was present, though not at the fatal encounter. He mentions news of the killing of a chief by another party being brought to the crowd surrounding Cook, as further inciting them, though William Bligh, in notes quoted by Commander Gould, contradicted this statement. Edgar's conclusion was, "had Capt. Cooke come down to the boats directly as he was advised he most probably would have sav'd his life, but he too wrongly thought as he said that the Flash of a Muskett would disperse the whole Island." He also notes that the islanders fought with "a surprising resolution." During the whole of this affair the launch under Lieut. Williamson lay at a distance without firing. It has generally been assumed that this arose from cowardice on his part—he was afterwards cashiered for his conduct at Camperdown—but Commander Gould publishes extracts from his journal concerning an earlier incident which seem to explain if they do not excuse, his behaviour at Kealakekua. In a conflict with the inhabitants of Kanai and a boat's crew under Williamson, the latter, after being compelled to shoot a native, enforced his orders upon his men that they were not to fire (apparently at the point of the pistol)—"being determined never to fire but when necessity obliged me and then to do execution. . . . These considerations and ye different opinions Capt. Cook and I held on this matter, made me request him never to send me on duty where I could not act from reason and ye dictates of my own Conscience. . . ." As Commander Gould comments, it is a complete enigma why this "high-principled fanatic" should have been detailed by Cook to cover his landing.

In another article in the same number Commander Gould publishes William Bligh's annotations on the official narrative of the third voyage.

ENGLISH MAP-SELLERS OF THE EIGHTEENTH TO NINETEENTH CENTURIES

Sir George Fordham calls attention to a mistake in our account of John More's map of Canaan lately acquired by the Society (January number, p. 95). It was there stated that R. H. Laurie (son of Robert Laurie, who with James Whittle had traded as Laurie and Whittle) was a successor of the firm carried on by Carington Bowles and Bowles and Carver respectively. This is misleading, for though Laurie and Whittle may have got into their hands some of the

business of the Bowles firm, they were the actual successors of Robert Sayer. Information about these various firms is to be found in Mr. Chubb's work on the Atlases of Great Britain and Ireland.

LAKE AMADEUS, CENTRAL AUSTRALIA

We have received from the Rev. J. Huston Edgar a short account of a recent journey in Central Australia. The region traversed coincides to some extent with that described by Mr. Donald Mackay in the paper printed in this number of the *Journal*, and the map on p. 260 will also serve to illustrate this note. Mr. Edgar made his journey in June, July, and August last year, on behalf of the Aborigines' Friends' Association, accompanying a small party led by Mr. E. E. Kramer. The first stage was from Erldunda Cattle-station to Opparinna Springs in the Western Musgrave Range, and thence through the Mann and Tomkinson Ranges to Harriet Springs in Western Australia. The return was by a north-easterly route to Mt. Olga and the shores of Lake Amadeus. The approach to the lake was across high regular sand-ridges, covered with trees, bushes, and *Triodia*, succeeded by circular or crescentic flats, a mile or two across, with groves of desert oak and mulga thickets. The first sign of the proximity of the lake was the appearance of the conspicuous outline of Winnal's Ridge, on the north shore. In the last few miles the sandhills gave place to a level mulga-covered plain, crossed by a creek-like depression which ultimately brought them to the south-east shore of Lake Amadeus. To Mr. Edgar the appearance of the lake was as "unexpected as it was beautiful," he having been led to picture it as a "dead sea" among barren sandhills; actually the southern shore was fringed with thickets of shrubs and "oaks," the farther shore was marked by a line of rich, dark green vegetation, and between lay a shining surface—soft but not boggy, and encrusted with salt. The party was able to walk out for half a mile upon it. Except for some tracks upon this surface, there was no sign of animal life. It is noteworthy that Mr. Edgar's description recalls that of Mr. W. H. Tietkens, who explored the western end of the northern shore in 1889. He writes of it opening out into "rather extensive flats of salt bush, cotton bush, grass, clay-pans, and mulga," and again of "oak forests with occasional clumps of white gum trees." Mr. Edgar also refers to "sentinel" moats and lakelets around its edge which prevent the rainfall, which he believes from the vegetation to be "liberal," from reaching the lake. The party then travelled through the Kernot Range (west of Basedow Range) to Alice Springs.

From observations on this journey, Mr. Edgar believes that Lake Amadeus may once have drained eastwards to the Finke River, along a depression south of the Basedow and Erldunda ridges. Altitudes by barometer were—Lake Amadeus 1325 feet, and Ayer's Rock 1475 feet at foot. The altitudes of glens in the Kernot hills were very little greater than that of the lake; Erldunda is about 940 feet above sea-level, and the line of this suggested connection is marked by small salt lakes and springs. It is possible that the formation of sand dunes eventually interrupted this connection, but whether there was ever sufficient run-off from this district to maintain it is at least doubtful.

OBITUARY

MR. A. J. IRWIN

On 6 December 1928 there died at Cheltenham, in quiet retirement, one who for twenty-two years had served the Government of Siam in the Survey Department of that country. Arthur J. Irwin, B.A., B.A.I. (Trinity College, Dublin), A.M.I.C.E., son of Colonel Richard Irwin, of Rathmoyle, Roscommon, was selected in 1897 by the late Mr. James McCarthy, then Director of the Department, to take charge of its Survey School. He continued to superintend that training college for young Siamese till 1909, when it became merged in another institution. It was early recognized, however, that his qualifications were even more suited to the active professional work demanded of a surveyor. Appointed Deputy-Director in 1902 he became largely responsible for the field-direction of the cadastral survey, at that time the foremost undertaking of the Department. This dual control was effected by attaching his students to field-parties during the field season.

When topographical survey came to the front in 1908 Mr. Irwin was deputed to train the field force required. The Department having been transferred from the Ministry of Agriculture to the Army in 1910, this branch was considerably developed under his direct supervision. In 1914 he was appointed Adviser to the Department, and remained in that responsible position till 1919, when he retired on a well-earned pension. He had already been decorated twice by the King for his services. His severance from the Siamese service was noted in the Annual Report of the Department with these appreciative words: "He had energetically devoted himself to the work consequent on the initiation and prosecution of the modern topographical survey of Siam. His high professional attainments coupled with a high loyalty made him respected and esteemed by all his fellow-officers. His retirement occasioned a distinct loss to the Department, and was much regretted by the superior authorities of the War Office "

Such in outline was his official career in Siam. The most striking trait in his character was his cheerful response to every demand made upon his service, and this was true also of the social side of his life. He had many personal friends, and the geniality and sterling quality of his nature, always attractive and striking, caused them to retain their warmth of feeling for him to the last. As a good sportsman he was held in high regard in Siam. One and all will lament his loss. He left a widow and two sons. R. W. G.

CORRESPONDENCE

NOTES ON JUBALAND

May I contribute a few observations to the interesting "Notes on Jubaland" by Capt. Clifford in the *Journal* for November? In regard to the all-important water question, Capt. Clifford is, I think, perfectly correct in stating (p. 436) that "the essence of the whole problem is irregularity." It was about June 1915 (I have not my diary with me) that I encountered a torrential fall of rain west of Afmadu, and a few weeks previously had found water, from a few inches to 3 feet deep, flowing in one place down the Lak Jira. Capt. Clifford does not mention this channel, which I considered almost as important as the Lak Dera to the south. The two run roughly in the same direction and join near and to the west of Afmadu, the combined channels continuing under the name of Lak Dera to the Deshak Wama. I made careful inquiries about this, and higher up visited both laks.

For water to flow the entire length of either must be very rare. Nevertheless I inferred, from the great numbers of the shells of *Ampullaria* and *Lanistes* and the presence of an occasional crab (Lak Jira), that surface water does in fact occur more frequently than might be gathered from native reports. Shortly afterwards, my friend Mr. Vincent Glenday informed me that a rainfall in one day of 3·48 inches had been recorded at Moyale in September 1916 (this and other figures are quoted in *Col. Rep. Miscell.*, No. 91, East Africa Protectorate, Cmd. 729, 1920), the flow of water in the Lak Buna 55 miles to the south-east being sufficient to move a full "barramill."

The wells of the Northern Frontier Province and Jubaland may be divided into the following groups :

(*a*) *Those sunk in the sediments of old and now dried lakes.*—Of these the wells at Wajhir (I adhere to the spelling used at the time) are the best examples. They are scraped in a calcareous sandstone of freshwater origin full of the shells of *Bythinia* and *Planorbis*. The basin may have been formed in the subjacent crystalline rocks by wind erosion. Here at Wajhir, as in other localities, it is clear that the wells were sunk to supplement and replace a failing surface supply; without such obvious indications no native would have thought of digging a well 30 feet deep in such a spot. The same is doubtless true of the wells at Eil Wak ; I saw no indications of "fissures developed probably by natural causes," mentioned by Capt. Clifford (p. 436).

The very unpleasant taste and slight medicinal effect is due to gypsum, which is soluble in slow-moving water. This gypsum is very plentiful, and at the time of my visit I thought indicated the drying of a lagoon. Any observations bearing on this point would be of interest; unfortunately owing to native unrest I was not allowed to traverse the country between Serenli and Eil Wak, where evidence might and probably would be obtained.

(*b*) *Narrow shafts in hill-wash and lateritic material*, e.g. at Oghberali, near Eil Wak. These were almost dry at the time of my visit in February.

(*c*) *In decomposed crystalline rocks*, e.g. Debell, south-east of Moyale. Here the ground is greatly faulted and shattered, which doubtless aids in the accumulation and preservation of the scanty rainfall.

(*d*) *Irregular sloping shafts in solid rock*, from the bottom of which the water is passed up by hand. Good examples of this type of well are seen at Ajow and Buttellu, on the main track between Moyale and Eil Wak, the rocks being highly crystalline quartzites, marbles, and various schists. It seems evident that springs must have formerly existed here.

(*e*) *Holes in the beds of Laks or on their banks*, the commonest manner of obtaining water.

Evidences of desiccation are everywhere to be seen ; the shells of freshwater molluscs lie scattered, for example, 20 miles west of the Lorian Swamp where now are the manyattas of the Boran and thin thorn trees. Localities were found 30 miles west of Eil Wak, where six species of freshwater molluscs were collected and identified by the late Mr. Bullen Newton, from places now showing no trace of surface water. On the march from Moyale to Marsabit similar deposits were crossed west-south-west of the former Station ; in each freshwater shells were collected.

A former great extension of the E Uaso Nyiro is obvious near Archer's Post. At all these localities shallow-water lakes formerly existed, and no doubt the abandonment of the country by some at least of the inhabitants was due to the failure in their water supply. When at Wajhir, I was told that a hoe and a mortar for grinding corn had been found in the neighbourhood, indicating a former agricultural settlement.

It may perhaps be of advantage to remember, when sinking wells in the future, that such depressions are now, as they were then, the natural receptacles of the drainage, and that such subterranean movement of water as does take place must still continue in the same direction. Detailed observations on the sub-surface flow in these Laks would be of immense importance in the comprehending of the most prolific distribution of future wells, while a study of the numerous anastomosing channels of the Lak system would be of considerable interest as showing whether or not these are relics of a former delta now elevated above sea-level.

JOHN PARKINSON.

British Museum East Africa Expedition,
Lindi, Tanganyika Territory,
17 December 1928.

OASES OF THE LIBYAN DESERT

I HAVE been interested in Mr. Newbold's article (*G.J.*, December 1928, pp. 548–554) on "Oases of the Libyan Desert," and as on p. 554 he quotes certain Bornu traditions which were related to me, perhaps I may be permitted to supplement them with some further observations. Mr. Newbold is probably quite right in suggesting that "we might ignore the distance" (given by my informant) "for Mazrub as being an underestimate." My informant was merely trying to explain to me the general direction of the places about which I was inquiring, and it is more than probable that there was some error or misunderstanding about the "five days." On the other hand, he was very definite about the general direction of the route Abeshe–Fada—"El Maggarin"—"thence by desert to Kabar"—and my impression in the light of Mr. Newbold's paper is that El Maggarin or Magarin and Kabar are Kanuri equivalents of Merga in the one case, and Owenat or Jebel Kishshu (Kissu) on the other.

Mr. Newbold (p. 547) points out that the name Merga is unknown in the (Anglo-Egyptian) Sudan now, i.e. it is a pre-Arab name with relative suffix -ga as found, for example, in the name of the Oasis Wanyanga, north of Wadai, and the Manga district of Bornu, etc., etc. The first part of the name, however, as written by Mr. Newbold, *Mer*, is, it may be conjectured, the old and common Sudanese people-name Mar or Mir, which the traveller Barth, years ago, noted as a name of interest and importance in connection with Wadai, as, for instance, in the name Al-Mirin, given to one of the early or legendary kings of Wadai. Mir or Miria was also the pre-Kanuri capital of the country farther west, called Damargu in its more northerly parts, and farther south called Damagram, by a transposition of the R and G, and addition of the Kanuri suffix -am (people). It would seem that Magarin or Maggarin is, like Damagram, an euphonic metathesis of the consonants in Marga. Yacubi (A.D. 891) speaks of the import of slaves from both Miria and Meroe to Fezzan, while Idrisi (A.D. 1150) speaks of a place between Wadai and Fezzan called Marinda, "which is little visited because of the paucity of products and industry and commerce, so that it is only a rest-place or asylum for the people when they have been on raids" (Dozy's Edition, p. 49, transl.).

But just as in Bornu now M is a very common metathesis of B (e.g. Malta for Balda), so I believe this old tribal name Mar to be merely a variant of the more common Bar (man), just as Afer, Ifren, and Africa, are probably derived from variants of the root *Bar* (*op. cit.*, note, p. 102). The peoples called in different locations Mar or Mir, Mirin, Maroin, and Marwa, were, I think, tribes which, adopting the more general pronunciation, would be called Barbar, or Barku

(Borku), which is even now the Sudanic appellation of Wadai. I think, then, that Merga and El Magarin are the same place and that either the Jebel Kishshu (Kissu) or the rock of Owenat is the Jebel known to the Kanuri as Jebel Annabi Musa, with its "rock of four seats" or place of "four springs" (manzil al arba'a).

If Mr. Newbold is right in supposing that the name of the well Ain el Kiyeh is derived from the Kanuri form of the tribal name Kai, Kiyi, Keyi, which means, in effect, Barbar tribes cognate to the Beli (Bideyat) and Zaghawa into which the reputed ancestor of the kings of Kanem married, then the names Kabila and Kabar are capable of being similarly connected with these early Barbar races (Kai).

Mr. Newbold notes that a variant name of Merga is Tura el Bedai. But Tura is the ordinary Kanuri or Wadaian name for "white races of North Africa," and one of the earliest Mais of Kanem bears the name (probably legendary) of Mai Ka-turi, i.e. (Mai) Kayi-Turi, which means the king who was "of the Beni Kayi" and also a Tura "or white man from the North." "Bila" is the ordinary Kanuri common noun for "town" or "country," so that Ka-bila merely means the town of the Kai or Kiyi, just as Kabar (which should strictly be spelt with two *r*s to denote the plural) means "men of the Kai, or Kayi."

In connection with these names and the name Wanyanga,* it may be noted that Idrisi, A.D. 1150 (*op. cit.*), speaks of encampments of the Bêli, and of the Beni Hilal (at that time moving south) and Juhaina Arabs, and of a place called Al Mar-agha (agha being the Kanuri-Teda word for alien natives), as lying south of Zeila (Murzuk) in the region of the Wahat al Kharija. Idrisi apparently calls the whole region of the outer oases by the name of Santariya, i.e. by the name of the people (San), still called Tariya or Tarowin in the Sudan. The singular of Tariya is Tarôwi, and the name denotes Barbars of cognate stock to Bêli and Zaghawa, the root Tar being the same as is found in Targi (with its Arab plural Tuwarik)—a Tuwareg. It is noticeable that in A.D. 1150 there was a town called Santariya farther north on the border of Egypt which had "been only founded in these latter days," according to Idrisi, the inference being that those Santariya had moved north at no very distant date. It is interesting to note that the variant name for Jebel Kissu is Jebel Anu-ar, for the terminal -ar is probably and presumably the same terminal as agha (pronounced ara) in the name Mar-agha, while Anu was the old Egyptian name for the sand-dwellers called Kash or Kish, whence Kishshu (Kissu) who were called by the Arabs An-ag.

Having regard to the history and characteristics of the mediaeval Kingdom of Kanem and Bornu, there is now a considerable body of evidence tending to show that the civilization of Meroe spread through the Mar or Bar of the Upper Nile (the Anag) to these Oases, and thence through the Kayi, i.e. Beli and Zaghawa, to Kanem and Bornu. On the other hand, just as the name of the legendary invader of Africa, Ifrikish, in the Arab legends would seem to be a compound of Bar and Kish or Kash, so also the Arab name Santariya (*temp.* Idrisi) for these outer and little-known oases seems very probably to be a form of the name of the classical tribe Daradae or Deriadae, who were looked on as part of the people better known as Blemmyes.

H. R. PALMER.

*Wanyanga, probably=Wa-n-yen-ga or Oases of the Yenga, cf. *op. cit.*, p. 18. Yen is a variant of Yam, the Kanuri name for the regions to the north and north-east of Wadai, as it was also the ancient Egyptian name for a region on the bank of the Nile in the same latitude.

MEETINGS: SESSION 1928–1929

Seventh Evening Meeting, 4 February 1929. The President in the Chair

Elections: Francis Frederic Boyer; Miss Amelia Wilson Cawthra; Mrs. Dorothy Drage, J.P.; J. W. Forsyth; L. J. Frankenthal; George J. Gilbert, M.B.E.; Group Capt. Arthur Lowthian Godman, C.M.G., D.S.O.; The Rev. Charles Alfred Griffin, M.A., PH.D., D.LITT., D.D.; Henry P. Hanham; Edward Bruce McGee; Ryrie Orr, M.A., J.P.; Charles Esmond Pain; Miss Lucy F. Payne, B.A.; Miss Edith Nichols Pringle; Idwal Gwynne Rees; Mrs. Janet Rose Roberts; H. Gordon Sagar; Charles Vincent Sale; Richard Wilcock Sellers; Alexander Rudolf Barbour Simpson, B.A., B.SC.; Capt. Thomas Alfred Owen Thompson, O.B.E.; Miss Dorothy Hulme Todd, B.A.; Christopher Harold Tyrrell; The Hon. A. R. F. Webber, M.L.C.

Paper: The Great Barrier Reef Expedition: a preliminary account. By Mr. J. A. Steers

Fourth Afternoon Meeting, 11 February 1929. The President in the Chair

Paper: The Tavistock Theodolite. By Capt. E. R. L. Peake, R.E.

Eighth Evening Meeting, 18 February 1929. Admiral Sir William Goodenough, Vice-President, in the Chair

Elections: Charles Herbert Belcher; John Muir Bowie; William Edward Browne; Nigel Keith Chapman; Alfred Erwood; William Arthur Grantham; Miss Agnes M. Hampton, M.A.; Frank John Hosking; Miss Mary Howitt; Col. J. E. Leckie; William Austin Maguire; Archibald Galland Mellors; Miss May Elizabeth Miles; L. J. Robbins, M.A., B.SC.; Alfred William Milligan Robertson; Capt. Robert Carey Sinker, M.B.E., I.A.; Farquhar Tait, A.M.INST.C.E.; Lt.-Col. Leslie C. Thuillier, I.A.; Dr. Emil Trinkler; Gerald England Tunnicliffe, LL.B.; Charles William Hoste Welldon

Paper: Hudson Bay in 1928. By Mr. George Binney

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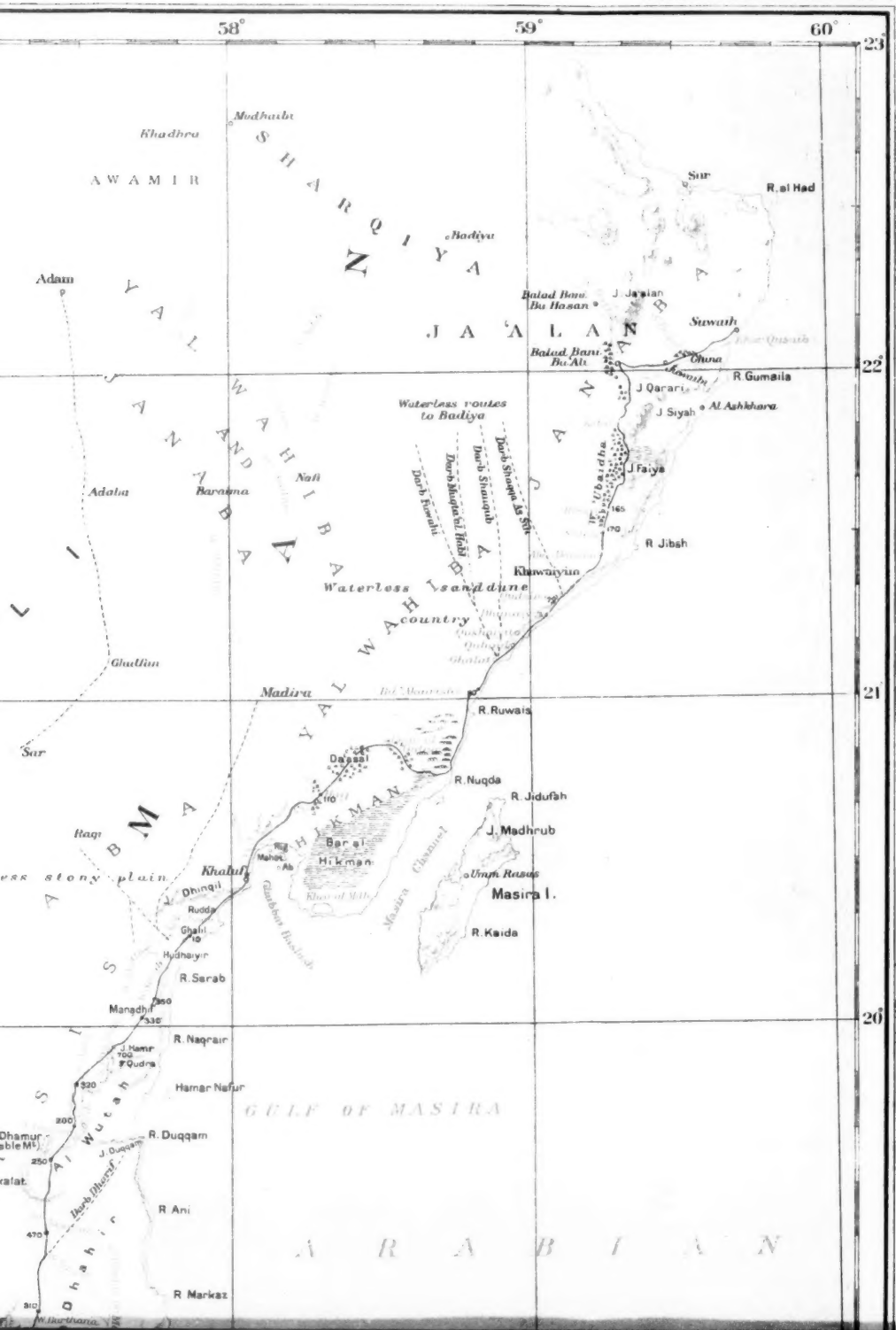
LL.B.;

Part of
SOUTH EAST ARABIA
from a route traverse
by
BERTRAM THOMAS
1928
Scale - 1 / 2,000,000
10 0 10 20 30 40 50
Miles
Reference
Author's route
Caravan halts
Heights in feet 327
Arab routes
Sand
Salt plains
Acacia jungle
Scrub
Railways
Scale - 1 / 20,000,000
50 0 50 100 150 200
Miles
Damascus
Jerusalem
Jaffa
TRANS JORDAN
Baghdad
Basra
Kuwait
Bushire
Shiraz
Aqaba
Hayil
Medina
Riyadh
'Oqair
Hufuf
Jask
Muscat
Sur
Area of Map
Adam
Sawnh
Jidda
Mecca
RUB 'AL KHALI
Masira I.
Port Sudan
Suakin
ASIR
DHUFAR
Kuria Muria Is.
Salala
Kunfida
YEMEN
Qishn
Hodeida
HADHRAMAUT
Mukalla
ABYSSINIA
Aden
Perim I.
Socotra
ANGLO-EGYPTIAN SUDAN
ERITREA
TRUCIAL 'OMAN
J. Akhdhar
ARABIAN SEA
Jaddat al Harasis
Waterless stony plain
J. Dhamur (Table Mt.)
J. Askalat
J. Dharif
Waterless ston
Adam
Sur


58°
59°
60°
23°
22°
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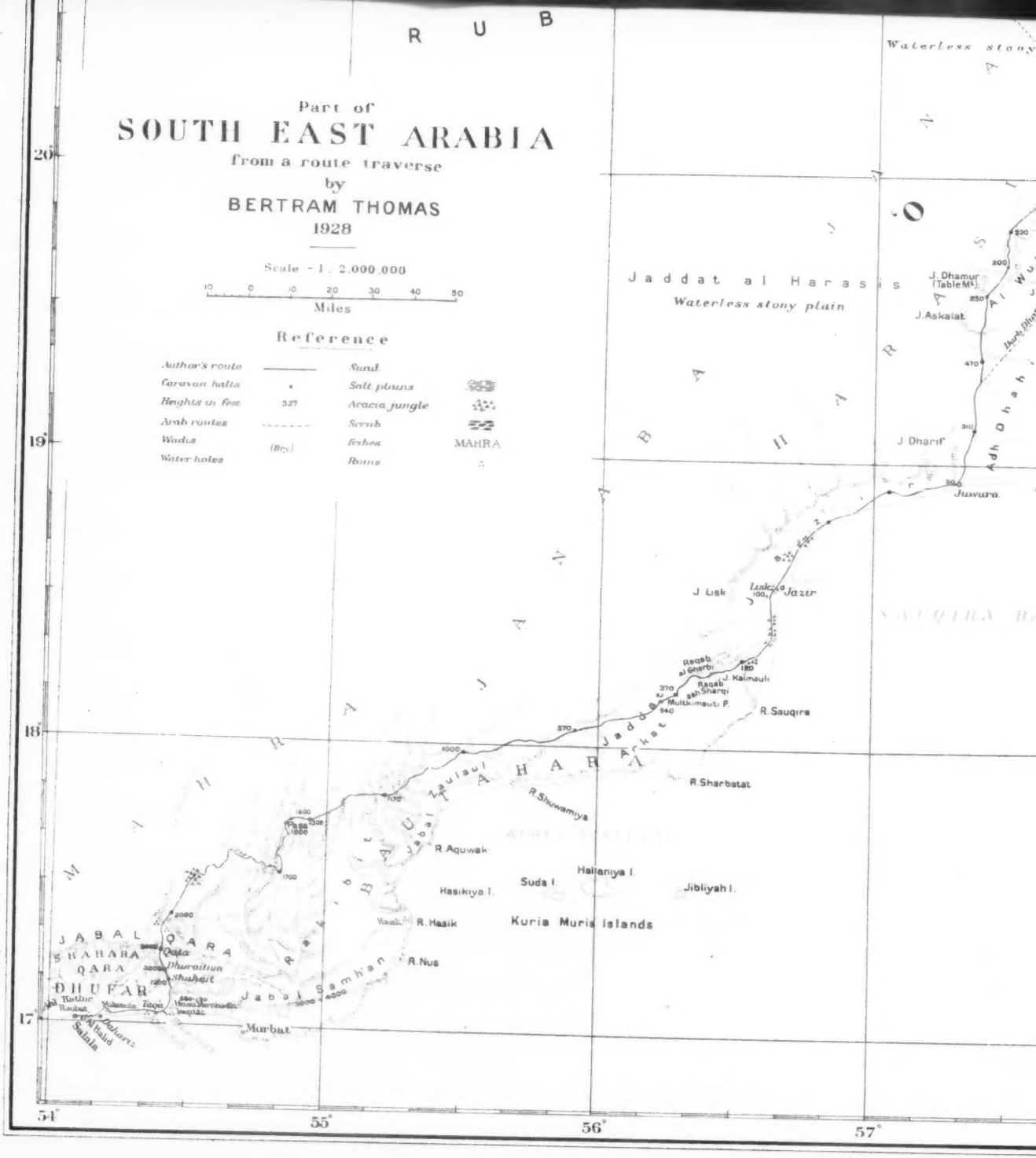
20°
Madhaib
Khadhra
AWAMIR
SHARQIYA
Badiya
Adam
Sur
R. al Had
Balad Banu Bu Hasan
J. Jaalan
JA'ALAN
Suwaih
Balad Banu Bu Ali
Ghana
R. Gumaila
J. Qarari
J. Siyah
Al Ashkhara
Waterless routes to Badiya
Darb Shaiqub
Darb Shaiqub Al Sab
Darb Muqta'at Hafit
Darb Fuwahi
Nafi
Adaba
Baraima
J. Faiya
R. Jibsh
Khawaiyun
Waterless sand dune country
Ghudlim
Madiva
R. Ruwais
Dassal
R. Nuqda
R. Jidufah
J. Madhrub
Barr al Hikman
Khalul
Dhingil
Rudda
Ghahi
Hudhaiyin
R. Sarab
Manadhir
R. Naqrain
Hamr
Qudra
Hamar Nafur
GULF OF MASIRA
R. Duqqam
R. Ani
R. Markaz
Masira I.
Umm Rasus
R. Kaida
ARABIAN


Part of
SOUTH EAST ARABIA
from a route traverse
by
BERTRAM THOMAS
1928
Scale - 1 / 2,000,000
10 0 10 20 30 40 50
Miles
Reference
Author's route
Caravan halts
Heights in feet
Arab routes
Wadis (Dry)
Water holes
Sand
Salt plains
Acacia jungle
Scrub
Tribes
MAHRA
Ruins
R U B
Waterless stony
Jaddat al Harasis
Waterless stony plain
J. Dhamur (Table Mt.)
J. Askalat
J. Dharif
Juwara
J. Lisk
Liskeyo
Jazir
Raqab al Gharbi
Raqab Sharqi
J. Kalmauli
Multikimauli P.
R. Sauqira
Jaddat Arkat
R. Sharbatat
R. Shuwamiya
R. Aquwak
Hasikiya I.
Suda I.
Halaniya I.
Jibliyah I.
R. Hasik
Kuria Muria Islands
R. Nus
JABAL QARA
SHAHARA QARA
DHUFAR
Qara
Dhuraitun
Shahait
Rakhyut
Taqa
Jabal Samhan
Murbat
Salala
Rahaut
Nbaid
Jabal Qamar
Jabal Qara
Jabal Dhofar
Wadi Darbat
Wadi Hasik
Wadi Nus
Wadi Aqwak
Wadi Shuwamiya
Wadi Sauqira
Wadi Dhahr
Wadi Dharif
Wadi Juwara
Wadi Lisk
Wadi Kalmauli
Wadi Sharqi
Wadi Gharbi
Wadi Arkat
Wadi Sharbatat
Wadi Jazir
Wadi Liskeyo
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Wadi Dhamur
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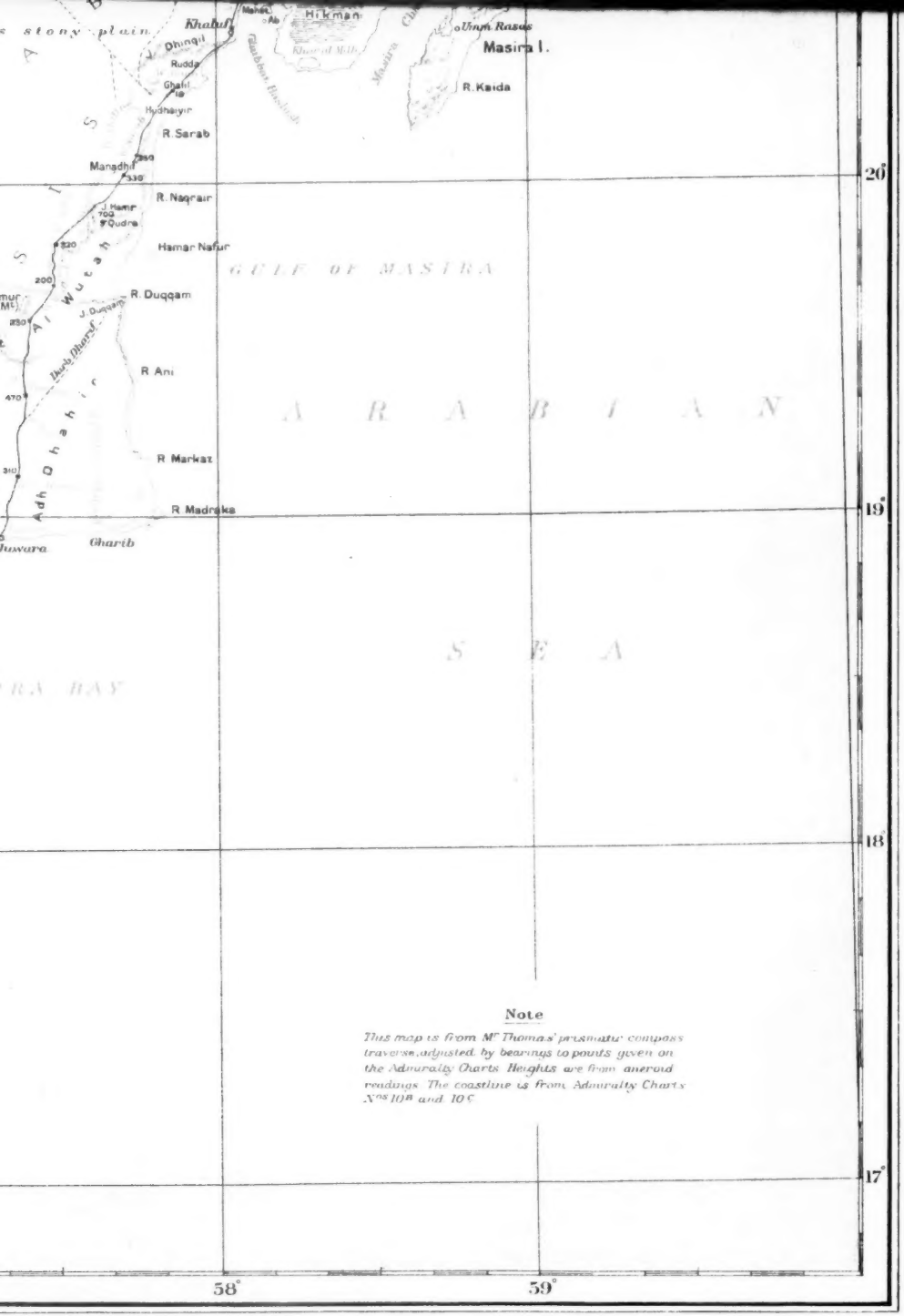
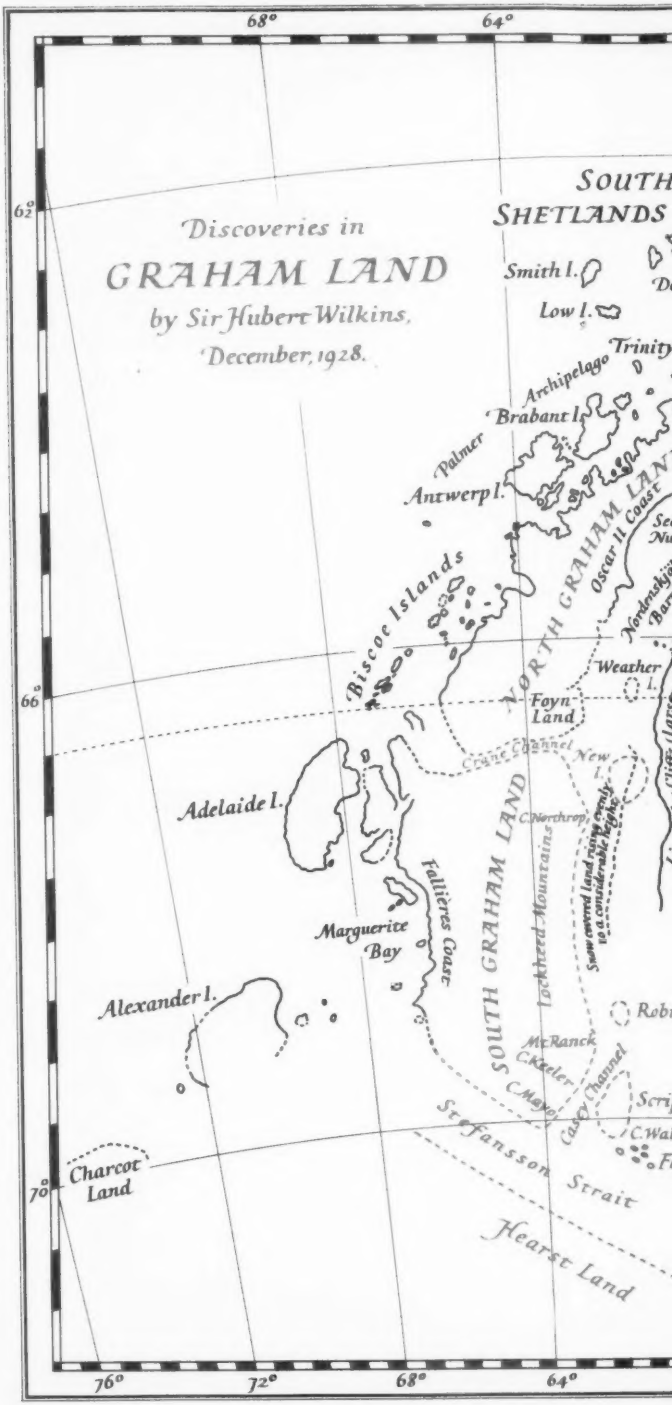
Wadi Liskeyo
Wadi Multikimauli
Wadi Askalat
Wadi Dhamur



Note

This map is from Mr Thomas' prismatic compass traverse, adjusted by bearings to points given on the Admiralty Charts. Heights are from aneroid readings. The coastline is from Admiralty Charts Nos 1018 and 1019.

S.E. ARABIA
Thomas


Discoveries in
GRAHAM LAND
by Sir Hubert Wilkins,
December, 1928.
SOUTH
SHETLANDS
Smith I.
Low I.
Trinity
Archipelago
Brabant I.
Palmer
Antwerp I.
Biscoe Islands
NORTH GRAHAM LAND
Oscar II Coast
Weather
Foyn Land
Crater Channel
New
Adelaide I.
C. Northrop
Lockheed Mountains
Fallières Coast
Marguerite Bay
SOUTH GRAHAM LAND
Alexander I.
McRanck
C. Keeler
C. Mayo
Casey Channel
St. Fansson Strait
Charcot Land
Hearst Land
68°
64°
62°
66°
70°
76°
72°
68°
64°

ANTARCTIC REGIONS
Wilkins